

INITIAL
4 IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of: Nancy Chang, et al.

Serial No. : 06/659,339

Filed : October 10, 1984

For : CLONING AND EXPRESSION OF HTLV-III DNA

ATTN: Mr. Brian Hearn
Assistant Commissioner for Patents
Box DAC
Washington, D.C. 20231

SUPPLEMENTAL RENEWED PETITION UNDER 37 CFR §1.182

Sir:

Attached is a SUPPLEMENT TO THE REQUEST FOR RECONSIDERATION OF THE MARCH 29, 1996 DECISION DISMISSING APPLICANTS' PETITION PURSUANT TO 37 CFR §1.182 TO ADD A REFERENCE TO A PRE-FILING DATE DEPOSIT.

The Assistant Commissioner is hereby authorized to charge any additional fees which may be required in this application, including a petition fee, to Deposit Account No. 13-4500; Order No. 1436-4094. A DUPLICATE COPY OF THIS DOCUMENT IS ATTACHED.

Respectfully submitted,

MORGAN & FINNEGAN, L.L.P.

By William S. Feiler
William S. Feiler
Reg. No. 26,728

Of Counsel:

Eugene Moroz, Esq.
M. Caragh Noone, Esq.
MORGAN & FINNEGAN, L.L.P.
345 Park Avenue
New York, NY 10154
(212) 758-4800
(212) 751-6849 (FAX)

235577_1

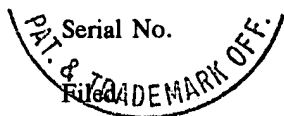
EH057206850US

James C. Haight
NATIONAL INSTITUTES OF HEALTH
Office of Technology Transfer
Suite 325
6011 Executive Blvd.
Rockville, MD 20852
(301) 496-7056

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

96 JUL 29 AM 1:50

Applicant(s) : Nancy Chang, et al.



Serial No. : 06/659,339

Filed : October 10, 1984

For : CLONING AND EXPRESSION OF HTLV-III DNA

EXPRESS MAIL CERTIFICATEExpress Mail Label No. EH 057 206 850 USDate of Deposit July 29, 1996

I hereby certify that the following attached paper(s) or fee

Supplement To Request For Reconsideration Of The
March 29, 1996 Decision Dismissing Applicants' Petition
Pursuant to 37 CFR §1.182 To Add A Reference To A
Pre-Filing Date Deposit;
Supplemental Renewed Petition Under 37 CFR §1.182; and
Return postcard.

is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under
37 C.F.R. §1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks,
Washington, D.C. 20231.

Francisco Garcia(Typed or printed name of person
mailing paper(s) or fee)(Signature of person mailing
paper(s) or fee)

Mailing Address:

MORGAN & FINNEGAN, L.L.P.
345 Park Avenue
New York, New York 10154
(212) 758-4800
(212) 751-6849 Telecopier

FORM: EXP-MAIL.NY
Rev. 3/27/95

INITIAL REVIEW
95 JUL 29 AM 1:50
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Here application of: Nancy Chang, et al.
Serial No. : 06/659,339
Filed : October 10, 1984
For : CLONING AND EXPRESSION OF HTLV-III DNA

ATTN: Mr. Brian Hearn
Assistant Commissioner for Patents
Box DAC
Washington, D.C. 20231

SUPPLEMENT TO REQUEST FOR RECONSIDERATION OF
THE MARCH 29, 1996 DECISION DISMISSING
APPLICANTS' PETITION PURSUANT TO 37 CFR §1.182
TO ADD A REFERENCE TO A PRE-FILING DATE DEPOSIT

Sir:

Applicants would like to thank Special Projects Examiner Brian Hearn for the courtesies extended in the Interview on May 28, 1996. The following additional comments are respectfully offered in support of their May 28, 1996 Request for Reconsideration of the March 29, 1996 decision dismissing their petition to insert a reference to the pre-filing date deposit of recombinant phage clone λ BH-10, which is specifically identified in the specification of U.S.S.N. 06/659,339 ("the '339 application").

Applicants submit that for the reasons set forth below, as well as those in their May 28, 1996 Request for Reconsideration and their Petition, amendment of U.S.S.N. 06/659,339, now abandoned, to add the reference to the deposit is appropriate pursuant to the governing case law, the PTO deposit rules, 37 CFR

§§1.801-1.809, and the Manual of Patent Examining Procedure ("MPEP").

1. The Reference to the Deposit of Clone λBH-10
Is Not New Matter Under 35 U.S.C. §132

As explained in the Request for Reconsideration in In re Lundak, 773 F.2d 1216, 227 U.S.P.Q. 90 (Fed. Cir. 1983), the Federal Circuit held that a post-filing date deposit and of a biological material "is not new matter under 35 U.S.C. §132" and is permissible where the biological material is identified in the specification as filed. Lundak, 773 F.2d at 1223, 227 U.S.P.Q. at 96 (emphasis added). The Lundak court rejected the Board's argument "that both the deposit and its accession number are new matter," Lundak 773 F.2d at 1223, 227 U.S.P.Q. at 95, and explained:

An accession number and deposit date add nothing to the written description of the invention. They do not enlarge or permit the disclosure. This is not the shape of new matter against which section 132 was designed to guard.

Lundak, 773 F.2d at 1273, 227 U.S.P.Q. at 95 (emphasis added.)

In the instant situation, applicants are seeking to add the accession number and date of the pre-filing date deposit of clone λBH-10, which, as discussed in the Request for Reconsideration, the Amendment, and the Declaration of Dr. Wong-Staal, is specifically identified and described in the '339 specification as filed on page 3, lines 28-30, page 8, lines 33 to

end, and page 9, lines 1-8. Thus, the reference to the deposit of clone λBH-10, is not new matter under Lundak.

Applicants' argument that Lundak permits post-filing date deposits of biological materials identified in the specification as filed is supported by Ex parte DeCastro, 28 U.S.P.Q. 2d 1391 (Bd. Pat. App. & Int. 1993). In DeCastro, the Board, noting that in Lundak "a subsequent deposit of biological material described in the original application was determined to be sufficient to comply with the enablement requirement of 35 U.S.C. §112, first paragraph", held that post-filing date deposit of a biological material that was not identified or described in the specification could not rectify the enablement problems that were found to exist. DeCastro, 28 U.S.P.Q. 2d at 1394 (emphasis added). Thus, the DeCastro case makes clear that Lundak is properly understood to permit post-filing date deposits (and references to the deposits) of biological materials identified in the specification as filed.

Moreover, the Federal Circuit's decision in Lundak, that a post-filing date deposit or reference to a deposit of a biological material identified in the specification is not new matter, is supported by the PTO deposit rules, the MPEP and pertinent case law.¹ The deposit rules make clear that the

¹ Pursuant to Mr. Hearn's request at the interview, applicants have obtained a copy of the Lundak application. The abstract contains a statement manifesting an intent to make a deposit. However, applicants submit that this statement is irrelevant to the holding in Lundak and the decision on the instant petition. Indeed, the Lundak court broadly held "that the insertion of depository data after filing is not new matter under 35 U.S.C. §132." Lundak 773 F.2d at

biological material, not the intent to deposit the material, must be referenced in the specification as filed:

Whenever a biological material is specifically identified in an application for patent as filed, an original deposit thereof may be made at any time before filing the application for patent or, subject to 1.809, during pendency of the application for patent.

37 C.F.R. §1.804(a) (emphasis added).

The MPEP explains that the fact that the biological material to be deposited is referenced in the specification as filed provides an antecedent basis for the deposit, preventing it from being new matter:

37 C.F.R. §1.804(a) specifies not only a permissible time for making an original deposit, but also specifies that the biological material deposited must be specifically identified in the application as filed. The requirement of a specific identification is consistent with the description requirement of the first paragraph of 35 U.S.C. 112 and provides an antecedent basis for the biological material which either has been or will be deposited before the patent is granted.

MPEP §2406.01 (emphasis added). Indeed, the MPEP makes clear that while a post-filing date deposit of an identified biological material does not implicate the prohibition against new matter,

1223, 227 U.S.P.Q. at 96. Moreover, as discussed infra, the deposit rules (37 CFR §1.804) and MPEP (§2404.03 and §2406.01) make clear that the biological material, not the intent to deposit, must be referenced in the specification as filed. In short, both Lundak and the PTO rules and procedure require only that the biological material be identified in the application as filed.

addition of a reference to a previously unidentified biological material is potentially prohibited by 35 U.S.C. §132:

It should be noted, however, that reference to a biological material present in an application upon filing, may form the basis for making a deposit, where required, after the filing date of a given application, but that the reference to the biological material itself cannot be added after filing without risking the prohibited introduction of a new matter. 35 U.S.C. 132

MPEP §2404.03 (emphasis added)

Additionally, decisions of the Board of Patent Appeals and Interferences as well as the Court of Customs and Patent Appeals make clear that addition of information which clarifies or describes inherent characteristics or properties of the disclosure, such as the depository information sought to be added here, is not new matter barred by 35 U.S.C. §132. In Application of Reynolds, 443 F.2d 384, 170 U.S.P.Q. 94 (C.C.P.A. 1971), the Court of customs and Patent Appeals explained:

By disclosing in a patent application a device that inherently performs a function, operates according to a theory, or has an advantage, a patent applicant necessarily discloses that function, theory or advantage even though he says nothing concerning it. The application may later be amended to recite the function, theory or advantage without introducing prohibited new matter.

443 F.2d at 1293, 170 U.S.P.Q. at 98.

Similarly, in Tektronix, Inc. v. United States, 445 F.2d 323 (Ct. Cl. 1971), the Court of Claims held that clarifying or making explicit information which was implicit in the specification as filed did not violate the prohibition against new matter of 35

U.S.C. §132. Tektronix, 445 F.2d at 326-327. The Tektronix patentee amended a drawing to show a previously omitted component of the claimed device and amended the specification to explain and describe the added component. The court concluded that these "clarifying amendments" were not new matter and that by their addition, "an implicit teaching was made explicit." Tektronix 445 F.2d at 349. A copy of this decision is attached as Exhibit A.

In Ex parte Doushkess, 47 U.S.P.Q. 525 (Pat. Off. Bd. of App. 1940) the Board held that addition of disclosure regarding the solubility of the claimed compound was not new matter although this property alone distinguished the invention over certain prior art. The Board explained that because solubility "was an inherent characteristic of the [claimed] mixture," addition of the disclosure regarding this property was not new matter. Doushkess, 47 U.S.P.Q. at 525-526. See also Ex parte Davisson and Finlay, 133 USPQ 400, 402 (Pat. Off Bd. App. 1958) (noting that entry of an amendment which described inherent properties or characteristics of the claimed substance, such as its optical rotation data and spectroscopic characteristics, was proper).

Clearly, addition of information concerning the pre-filing deposit of a HIV clone that was identified and described in the specification as filed simply serves to clarify and make explicit information that was inherent in the disclosure at the filing date. Thus, the amendment sought is not new matter according to these decisions.

In short, the governing case law and PTO rules and procedure all make clear that a post-filing date reference to a biological material specifically identified in the specification as filed is permissible and is not new matter under 35 U.S.C. §132.

2. The Amendment Sought Is Permissible In an Abandoned Application

The PTO and courts have permitted applicants to amend abandoned applications to add or correct technical information. For example, in In re Schmidt, 130 U.S.P.Q. 404 (C.C.P.A. 1961), amendment of an abandoned application to correct the inventorship was sanctioned. Schmidt, 130 USPQ at 410 ("We hold, therefore, that appellant was entitled under section 116 to correct the error in the intermediate [abandoned] application filed in the names of joint inventors").

Similarly, in Sampson v. Commissioner of Patents, 195 U.S.P.Q. 136 (D.D.C. 1996), the applicant was permitted to amend an abandoned application to include "technical information". In this case the technical information consisted of the filing dates and relationship to applications applicant was seeking benefit of. Sampson 195 U.S.P.Q. at 137.

In the instant petition, applicants seek to add only technical information regarding the pre-filing deposit of clone λBH-10 (e.g. the deposit date, accession number and identification of the depository). As discussed above, none of this information is new matter. Thus, the amendment sought is akin to those allowed in Sampson and Schmidt. As such, applicants respectfully submit it

is proper under the case law and PTO rules and procedure and should be entered.

3. Granting The Petition Will Not Create A Dangerous Precedent

In the interview held with Mr. Hearn on May 28, 1996, a concern was expressed that if the PTO were to permit the applicants to amend the '339 application, a plethora of similar requests could be expected which would inundate the Office of Petitions. Applicants respectfully submit that this concern is misplaced.

First, the Office of Petitions presumably has the option not to publish the decision to grant the instant petition. Second, even assuming such a decision was published, it would clearly be limited to the specific and highly unusual factual situation present in the '339 application. Applicants submit that the current situation, in which a deposit of a recombinant clone made over two months before the filing date of a now abandoned application was inadvertently not referenced in the specification as filed, although the clone itself was identified and described in the specification, is unlikely to ever arise again, much less in numbers sufficient to overwhelm the Office of Petitions.

Thus, any decision granting the instant petition would necessarily be limited to facts so unique they are unlikely to occur again. In short, applicants submit that the instant petition, which as discussed above is proper under the pertinent case law and PTO rules and procedure, and should be granted.

4. Conclusion

Applicants respectfully request that the March 29, 1996 Decision be reconsidered and that the petition be granted and the amendment to the '339 application be entered to more fully protect Applicants' patent rights.

5. Authorization

The Assistant Commissioner is hereby authorized to charge any additional fees which may be required in this application, including a petition fee, to Deposit Account No. 13-4500, Order No. 1436-4094.

Respectfully submitted,

MORGAN & FINNEGAN, L.L.P.

By William S. Feiler
William S. Feiler
Reg. No. 26,728

Mailing Address:

MORGAN & FINNEGAN, L.L.P.
345 Park Avenue
New York, New York 10154
(212) 758-4800
(212) 751-6849

TEKTRONIX, INC.

v.

**The UNITED STATES, Defendant, The
HICKOK ELECTRICAL INSTRUMENT
CO., et al.,
Third-Party Defendants.**

No. 79-61.

United States Court of Claims.

June 11, 1971.

Action against United States for unauthorized use of inventions described and claimed in eight patents owned by the plaintiff. Three of the government's supplier-indemnitors entered the suit as third-party defendants. The Court of Claims, Davis, C., held that all eight patents, which related to oscilloscopes and their electronic circuitry, were valid and infringed.

Judgment for plaintiff, extent of liability to be determined in further proceedings.

[1] PATENTS ⇌ 328(2)

291k328(2)

2,883,619, 2,930,986. Claims 1 and 6 of patent No. 2,883,619 describing electrical probes used for transmitting signal voltages from circuit under test to wide-band amplifier without distorting signal and claim 1 of patent No. 2,930,986 describing distributed amplifier used in oscilloscope's vertical circuitry were valid and infringed by third-party defendant's oscilloscope.

[2] PATENTS ⇌ 328(2)

291k328(2)

2,804,571. Claims 5 and 8 of patent No. 2,804,571 describing unblanking circuit for cathode-ray tube of oscilloscope were valid and infringed notwithstanding contention of invalidity over prior art particularly in view of patent not cited by patent office during prosecution of application.

[3] PATENTS ⇌ 100

291k100

Patent applicant's amendment of drawing and

specification in response to queries by patent examiner, thereby simply making explicit a disclosure which was implicit in application as filed was not prohibited addition of new matter to disclosure. 35 U.S.C.A. § 132.

[4] PATENTS ⇌ 328(2)

291k328(2)

2,826,694. Claim 1 of patent No. 2,826,694 describing so-called free-running multivibrator for use with sweep generator in oscilloscope's horizontal circuitry was valid and infringed by defendant's oscilloscope.

[5] PATENTS ⇌ 328(2)

291k328(2)

3,061,788. Claims 2 and 4 of patent No. 3,061,788 describing hold-off circuit for use in conjunction with multivibrator and sweep generator in horizontal circuit of oscilloscope were valid and infringed.

[6] PATENTS ⇌ 237

291k237

Where allegedly infringing devices did substantially same thing in substantially same way to get substantially same result as patented device, they infringed.

[7] PATENTS ⇌ 168(1)

291k168(1)

Doctrine of file wrapper estoppel prevents patentees from construing claims inconsistent with limitations added during patent office prosecution to distinguish over prior art.

[8] PATENTS ⇌ 168(1)

291k168(1)

Doctrine of file wrapper estoppel does not necessarily operate to eliminate all equivalents.

[9] PATENTS ⇌ 112.1

291k112.1

It is assumed that patent applicant, in drafting claims, did not intend to narrow their scope any more than necessary to distinguish over prior art.

[10] PATENTS ⇌ 274

291k274

Evidence in action for unauthorized use of inventions established that pentode and triode in accused device were equivalent to diode in patented device.

[11] PATENTS ⇌ 328(2)
291k328(2)

2,769,905. Claims 1 and 5 of patent No. 2,769,905 describing sweep generator for producing sawtooth waveform of precise configuration for application to horizontal circuitry of cathode-ray tube were valid and infringed.

[12] PATENTS ⇌ 237
291k237

Important consideration in determining equivalency of elements of accused's device and of patented device was whether those skilled in art treated elements or parts as equivalents.

[13] PATENTS ⇌ 328(2)
291k328(2)

2,769,904. Claims 1 and 8 of patent No. 2,769,904 describing sawtooth generator circuits for use in horizontal circuits of an oscilloscope were valid and infringed.

[14] PATENTS ⇌ 120
291k120

Where claims of three patents, though necessarily directed to related subject matter, defined distinct and separate inventions, i. e., a combination and two subcombinations, they were not identical or substantially identical in scope and thus did not define same invention.

[15] PATENTS ⇌ 328(2)
291k328(2)

2,853,609, 3,061,788. Claims 1, 16 and 19 of patent No. 2,853,609 describing multivibrator hold-off circuit for use in conjunction with multivibrator and sweep generator in oscilloscope's horizontal circuitry were valid and infringed.

FEDERAL COURTS ⇌ 1116.1
170Bk1116.1

Formerly 170Bk1116

The practice in the Court of Claims is that when a party wishes to raise the issue of

validity of the patent in suit, it says so. An ambiguous request by defendant to the trial commissioner to find that the differences between the patent and an earlier one "are minor and unimportant" and that the two devices "are very nearly identical," is not sufficient to alert the commissioner that the validity of the patent is being challenged.

PATENTS ⇌ 328(2)

291k328(2)

2,549,833, 2,562,295, 2,594,104, 2,661,421.
Cited.

*324 Robert F. Conrad, Washington, D.C., attorney of record, for plaintiff.

Michael W. Werth, Washington, D.C., with whom was Asst. Atty. Gen. L. Patrick Gray, III, for defendant.

Richard J. Egan, Cleveland, Ohio, attorney of record, for The Hickok Electrical Instrument Co.

Boris Haskell, Washington, D.C., attorney of record, for Jetronic Industries, Inc.

Robert E. Burns, New York City, attorney of record, for Lavoie Laboratories, Inc.

Before COWEN, Chief Judge, and LARAMORE, DURFEE, DAVIS, COLLINS, SKELTON, and NICHOLS, Judges.

OPINION

PER CURIAM:

This case was referred to Trial Commissioner James F. Davis with directions to make findings of fact and recommendation for conclusions of law. The commissioner has done so in an opinion and report filed on April 22, 1970. Exceptions to the commissioner's opinion, findings of fact and recommended conclusion of law were filed by the third-party defendant, The Hickok Electrical Instrument Co., and defendant, The United States. The case has been submitted to the court on the briefs and oral argument of counsel for plaintiff and the excepting parties.

Since the court agrees with the opinion, findings and recommended conclusion of law of the trial commissioner, it hereby adopts the same, as hereinafter set forth, as the basis for its judgment in this case. Therefore, the court concludes that the patent claims in Patent 3,061,788--claims 2, 4, Patent 2,769,905--claims 1, 5, Patent 2,769,904--claims 1, 8, Patent 2,853,609--claims 1, 16, 19, Patent 2,883,619--claims 1, 6, Patent 2,930,986--claim 1, Patent 2,826,694--claim 2, and Patent 2,804,571--claims 5, 8, are valid and infringed and that plaintiff is entitled to recover reasonable and entire compensation for unauthorized use by defendant of the patented inventions so-claimed. Judgment is entered for plaintiff accordingly with the amount of recovery to be determined pursuant to Rule 131(c)(2).

OPINION OF COMMISSIONER

DAVIS, Commissioner:

This is a patent suit under 28 U.S.C. § 1498 to recover 'reasonable and entire *325 compensation' for alleged unauthorized use by defendant, the United States, of inventions described and claimed in eight patents owned by plaintiff. Only the issue of liability is before the court; accounting, if any, is deferred to later proceedings. The patents relate to oscilloscopes and their electronic circuitry. Pursuant to notice under Rule 41 (previously Rule 23), three of the Government's supplier-indemnitors, who furnished the alleged infringing devices, entered the suit as third-party defendants: The Hickok Electrical Instrument Co., Jetronic Industries, Inc., and Lavoie Laboratories, Inc. The third-party defendants participated in the trial. Hickok and Jetronic submitted proposed findings and briefs with respect to oscilloscopes supplied by them to the Government. Lavoie is now bankrupt; and the United States submitted proposed findings and a brief in Lavoie's behalf.

Defendants raise the usual issues of patent invalidity and noninfringement. For reasons below noted and more fully set out in the findings of fact, all eight patents are held

valid and infringed.

Background and patents in suit

Oscilloscopes are electronic measuring instruments used to inspect and analyze the characteristics of electrical signals. In essence, the purpose of an oscilloscope is to produce on a picture tube, akin to an ordinary TV screen, a graph-like representation of the signal to be inspected. Oscilloscopes comprise three basic components: a cathode-ray tube, similar to a TV picture tube; a horizontal circuit for producing on the tube a horizontal line representing time; and a vertical circuit, to which the signal to be analyzed is applied, for producing variations in the horizontal line proportional to and characteristic of the signal. The cathode-ray tube is an elongated vacuum tube with a phosphor-coated screen at one end and an electron gun at the other end. The electron gun emits a beam of electrons which impinge upon the screen, causing it to fluoresce and produce a spot of light where struck. The horizontal circuit functions to move (or sweep) the spot horizontally across the screen at a predetermined rate such that the spot appears as a line. The vertical circuitry functions to move the spot up and down. The spot of light persists on the screen for a short time after the electron beam sweep moves on; and thus the horizontal and vertical circuits work together to produce on the screen a visual graph-like display.

The patents in suit relate to an oscilloscope's horizontal and vertical circuits. Six of the patents describe inventions dealing with horizontal circuits and, in general, have to do with the requirement that the circuits be precisely controlled with respect to incoming signals. The other two patents deal with vertical circuits, particularly the transmission and amplification of incoming signals. Defendants do not challenge the validity or infringement of the two patents relating to vertical circuits. It is therefore unnecessary to discuss those patents in detail. The issues all relate to the six patents which describe horizontal circuits. Generally and somewhat oversimplified, the horizontal circuits in question have four components: a sweep

generator, a multivibrator, a signal trigger, and a delay (or hold-off) system. The sweep generator is the heart of the circuit. Its function is to generate a linearly rising voltage which, applied to deflection plates in the cathode-ray tube, sweeps the electron beam horizontally across the tube. The multivibrator controls the sweep generator. In effect, it turns the sweep generator on and off by supplying to it one or the other of two control voltages. The signal trigger supplies to the multivibrator a pulse, by which the multivibrator is actuated. The delay or hold-off system serves to prevent the multivibrator from being triggered out of time by an incoming signal pulse and, particularly, until the conclusion of a sweep cycle.

*326 Plaintiff was organized in 1946 to manufacture oscilloscopes. Research and development led ultimately to production of Tektronix models 535 and 545, which embody the inventions of the patents in suit and which are improvements over earlier oscilloscopes in the art. The devices met with great commercial success, and sales up to the time of trial exceeded \$100 million. Third-party defendants Hickok, Jetronic and Lavoie, in response to the Government's desire to have alternative sources of supply for oscilloscopes of the type made by Tektronix, made and sold to the Government several models which are the subject of this suit. Hickok and Jetronic made models designated USM/81. Hickok also made models designated 1805 and 1805A. Lavoie made models designated LA265, LA265A and LA545. Plaintiff contends that the third-party defendants virtually copied its 535 and 545 models; and the evidence shows that the USM/81 and 1805 are identical in all material respects to the Tektronix devices. Indeed, Hickok does not deny infringement by such models of any of the patents in suit. The issues therefore come down to whether the patents are valid and whether Jetronic model USM/81, Hickok model 1805A and the three Lavoie models infringe the patents. Hickok and the United States, on Lavoie's behalf, contend that model 1805A and the three Lavoie models were expressly designed to avoid the patents in suit. The patents will be considered *seriatim*. [FN1]

FN1. The patent disclosures and the claims are for the most part long and complex and are set out in detail in the findings of fact. They are discussed in this opinion only to the extent necessary to understand the issues.

Patents 2,883,619 and 2,930,986

[1] The '619 patent describes electrical probes used for transmitting signal voltages from a circuit under test to a wide-band amplifier without distorting the signal. The '986 patent describes a distributed amplifier used in the oscilloscope's vertical circuitry. Plaintiff alleges infringement of claims 1 and 6 of the '619 patent and claim 1 of the '986 patent by Hickok oscilloscope model 1805. Neither infringement nor validity is challenged by Hickok or any other defendant. Therefore, the respective claims are held invalid and infringed.

Patents 2,804,571 and 2,826,694

The '571 patent describes an unblanking circuit for the cathode-ray tube of an oscilloscope. The '694 patent describes a so-called free-running multivibrator for use with the sweep generator in the oscilloscope's horizontal circuitry. Plaintiff alleges infringement of claims 5 and 8 of the '571 patent and claim 2 of the '694 patent by Hickok and Jetronic oscilloscopes, model USM/81. Infringement is not denied, but the parties challenge the validity of the claims.

[2] Jetronic says the '571 patent claims are invalid over the prior art, particularly in view of a patent to Martinez, U.S. 2,549,833, not cited by the Patent Office during prosecution of the '571 patent application. Martinez discloses a wideband amplifier similar to the floating power supply used in the unblanking circuit of the '571 patent. The record, particularly the expert testimony, does not support Jetronic's position, and the claims are therefore valid. (Finding 44.)

[3][4] Hickok says claim 2 of the '694 patent is invalid because during prosecution of the patent application, new matter was added to the disclosure in violation of 35 U.S.C. § 132.

The record does not support this argument for reasons noted in detail in finding 40. In essence, what the applicant did was amend the drawing and specification in *327 response to queries by the patent examiner, and thereby simply made explicit a disclosure which was implicit in the application as filed. Claim 2 is therefore valid. In sum, the respective claims of the '571 and '694 patents are valid and infringed by oscilloscope model USM/81.

Patent 3,061,788

[5] The '788 patent describes a hold-off circuit for use in conjunction with a multivibrator and a sweep generator in the horizontal circuit of an oscilloscope. The purpose of the hold-off circuit is to prevent incoming signals from actuating the multivibrator and sweep generator until the multivibrator and sweep generator have recovered from an earlier sweep cycle. Plaintiff alleges that claims 2 and 4 of the '788 patent are infringed by (a) Hickok and Jetronic oscilloscopes, model USM/81, (b) Hickok oscilloscope, model 1805, and (c) the three Lavoie oscilloscopes. Hickok challenges neither validity nor infringement. Jetronic does not challenge infringement, but contends that the claims are invalid. Jetronic says the claims are anticipated by or obvious in view of Fig. 4 of patent 2,769,905 in suit, which patent was cited and considered by the Patent Office as prior art during prosecution of the '788 patent. The record, particularly the expert testimony, does not support Jetronic's position. (Finding 14.) Accordingly, claims 2 and 4 are held valid and infringed by Hickok and Jetronic models USM/81 and Hickok model 1805.

The United States, on behalf of Lavoie, does not challenge the validity of the '788 patent. [FN2] The only remaining issue, therefore, is whether the three Lavoie models infringe the claims. The United States says that they do not infringe, its principal argument being that the Lavoie circuitry, designed to avoid the patent claims, instead follows the teachings of the prior art. For reasons below discussed, the record does not support this contention.

FN2. The Government argues that it raised the patent's validity by asking the trial commissioner to find that the differences between that patent and an earlier one 'are minor and unimportant * * *. The two holdoff circuits are very nearly identical.' This ambiguous request was not sufficient to alert the commissioner that the validity of the '788 patent was being challenged. The practice in this court is that, when a party wishes to raise validity, it says so. (Footnote by the court.)

The inquiry focuses on the multivibrator portion of the circuit. The purpose of the multivibrator is to actuate the horizontal sweep generator which, in turn, operates to move (or sweep) the electron beam in the cathode-ray tube across the tube face. The multivibrator is, in effect, a 'switch' which produces two output control voltages, one to turn on the sweep generator and the other to turn it off. One control voltage is produced when the multivibrator is in a 'first stable state,' the other when the multivibrator is in a 'second stable state.' The multivibrator described in the '788 patent has two tubes which, as recited in the claims, provide 'first and second stable states for providing a first control voltage when in said first state and a second control voltage when in said second state.'

[6] The multivibrator of the Lavoie oscilloscopes has three tubes rather than two, and according to defendant, establishes three stable states rather than two, thus avoiding the claims. However, even assuming a third stable state, the Lavoie multivibrator still meets the literal claim limitation of a 'first' and 'second' stable state, and it performs the claimed function of providing first and second control voltages. The record shows that the third stable state does not materially change the essential operating features of the circuit. The multivibrators *328 in question thus are fully equivalent since they do substantially the same thing in substantially the same way to get substantially the same result. *Sanitary Refrigerator Co. v. Winters*, 280 U.S. 30, 50 S.Ct. 9, 74 L.Ed. 147 (1929); *Graver Tank & Mfg. Co. v. Linde Air Products Co.*, 339 U.S. 605, 70 S.Ct. 854, 94 L.Ed. 1097 (1950). Contrary to defendant's argument, this is not

a case like *Westinghouse v. Boyden Power Brake Co.*, 170 U.S. 537, 18 S.Ct. 707, 42 L.Ed. 1136 (1898), where the accused device was so changed in principle that it performed the same or a similar function in a substantially different way, but nevertheless fell under the literal language of the claims.

[7][8][9] Defendant says that plaintiff is prohibited by the doctrine of file wrapper estoppel to read the claims on the Lavoie circuit or to rely on equivalency to make out infringement. The doctrine of file wrapper estoppel prevents patentees from construing claims inconsistent with limitations added during Patent Office prosecution to distinguish over prior art. *Exhibit Supply Co. v. Ace Patents Corp.*, 315 U.S. 126, 62 S.Ct. 513, 86 L.Ed. 736 (1942); *Autogiro Co. of America v. United States*, 384 F.2d 391, 181 Ct.Cl. 55 (1967). The record shows that during prosecution of the patent application, the patent examiner cited a prior art reference which describes a multivibrator having a single state, the operation of which in the circuit described is different from either plaintiff's or Lavoie's circuits. No doubt plaintiff is estopped to read the claims on such multivibrator circuit. However, the Lavoie multivibrator is not like the prior art but is in essence like plaintiff's, and it functions in substantially the same way. The doctrine of file wrapper estoppel does not necessarily operate to eliminate all equivalents. *Eastern Rotorcraft Corp. v. United States*, 397 F.2d 978, 184 Ct.Cl. 709 (1968); *Southern Textile Mach. Co. v. United Hosiery Mills Corp.*, 33 F.2d 862, 866 (6th Cir. 1929). And it is assumed that the patent applicant, in drafting the claims, did not intend to narrow their scope any more than necessary to distinguish over the prior art. *Hunt Tool Co. v. Lawrence*, 242 F.2d 347, 354, (5th Cir. 1957), cert. denied, 354 U.S. 910, 77 S.Ct. 1296, 1 L.Ed.2d 1428. For this and other reasons noted in finding 15, the three Lavoie oscilloscopes infringe claims 2 and 4 of the '788 patent.

Patent 2,769,905

[10][11][12] The '905 patent describes a sweep generator for producing a sawtooth

waveform of precise configuration for application to the horizontal circuitry of the cathode-ray tube. The sawtooth waveform produces the horizontal sweep of the electron beam across the tube. Plaintiff alleges that claims 1 and 5 of the '905 patent are infringed by (a) Hickok and Jetronic oscilloscopes, model USM/81, (b) Hickok oscilloscopes, models 1805 and 1805A, and (c) the three Lavoie oscilloscopes. No defendant challenges the validity of the claims. Therefore, the claims are held valid. Hickok does not challenge infringement by models 1805 or USM/81. Therefore, Hickok models 1805 and USM/81 infringe. Jetronic challenges infringement by its model USM/81 on various grounds set out in detail in finding 20. For reasons noted in finding 20, Jetronic's position is without merit; and, accordingly, Jetronic model USM/81 infringes.

The only remaining issue is whether Hickok model 1805A and the three Lavoie models infringe. The relevant part of the circuit is the sweep generator which includes, among other things, two diodes as part of a 'degenerative direct current feedback means.' Claims 1 and 5 call for 'a pair of series connected diodes' in combination with other circuit elements. For one diode of the 'pair' of diodes, Hickok substitutes in its circuit a pentode, connected as a grounded grid amplifier; and Lavoie substitutes a grounded grid triode. They *329 argue that infringement is thereby avoided. Plaintiff concedes that pentodes and triodes are not the same as diodes, but says that in the circuits in issue, Hickok's pentode and Lavoie's triode are equivalent to a diode, and that their substitution was solely for the purpose of avoiding the literal language of the claims.

It is fundamental patent law that infringement is not avoided by substituting for an element in a claimed device another element which is its full equivalent, i.e., does substantially the same thing in substantially the same way to get substantially the same result. *Sanitary Refrigerator Co.*, supra; *Graver Tank*, supra. Equivalency is a question of fact and must be resolved in each instance by analyzing the function of the elements or

parts concerned. An important consideration is whether those skilled in the art treated elements or parts as equivalents. Diodes, triodes and pentodes are all vacuum tubes having a cathode, from which electrons are emitted, and a plate, or anode, to which the electrons flow. Triodes and pentodes have, in addition, one grid (triode) or three grids (pentode) between the anode and cathode for regulating the flow of electrons by varying the potential (positive or negative) on the grid or grids. Thus, diodes, triodes and pentodes can be thought of, in a general way, as valves for controlling electron flow. Whether diodes, triodes and pentodes are equivalents in a particular circuit depends on the purpose for which used, i.e., their function in the circuit. Often, diodes, triodes and pentodes are not interchangeable, and thus are not equivalents, because of the different operating characteristics inherent in their construction. However, the record here, particularly the testimony of experts, establishes that in the circuits in question, the triode and pentode are equivalent to a diode. They all serve primarily to cut off current flow at desired times. Though the triode and pentode, unlike the diode, provide some amplification in the feedback circuit, the record shows that amplification is of negligible importance in the circuits in issue. In fact, one of defendant's experts testified that a diode was not used because it is 'covered by one of the Tektronix patents,' and that but for the patent, he 'would have been happy to put a diode there.' This is persuasive evidence of equivalency.

The United States points to a case in this court, *Marconi Wireless Telegraph Co. v. United States*, 81 Ct.Cl. 671 (1935), rev'd in part and aff'd in part, 320 U.S. 1, 63 S.Ct. 1393, 87 L.Ed. 1731 (1943), which it says stands for the proposition that diodes and triodes are not equivalents. No doubt, diodes and triodes are not necessarily equivalents; and under the facts of the Marconi case, they were held not to be. In Marconi, the accused devices (radios) used triodes rather than diodes, as called for in the patent, in order to get signal amplification, not feasible with a diode. Thus, triodes were used to perform a

significant and material function of which diodes are not capable, and they were not equivalent in the circuit in question. In the present case, however, Lavoie's triode (and Hickok's pentode) are used essentially for their diode function, the other differences in their operating features being not so significant or material as to affect the essential operation of the circuit.

In sum, the circuits of Hickok model 1805A and the three Lavoie models infringe claims 1 and 5 because they operate in substantially the same way with substantially the same means to get substantially the same result.

Patent 2,769,904

[13] The '904 patent describes saw-tooth generator circuits for use in the horizontal circuits of an oscilloscope. The circuitry of the '904 patent is a sub- *330 combination of the circuits described in the '905 patent. Plaintiff alleges infringement of claims 1 and 8 of the '904 patent by the oscilloscopes noted above with respect to the '905 patent. Defendants raise essentially the same arguments on the infringement issue as noted in discussion of the '905 patent; and for the same reasons, the claims are held infringed by all the accused devices.

As a further defense, Hickok says claims 1 and 8 are invalid over the prior art. As noted in finding 26, Hickok's position is without merit; and accordingly the claims are valid.

Patent 2,853,609

[14][15] The '609 patent describes a multivibrator hold-off circuit for use in conjunction with a multivibrator and a sweep generator in an oscilloscope's horizontal circuitry. Plaintiff alleges infringement of claims 1, 16 and 19 by (a) Hickok and Jetronic oscilloscopes, model USM/81, (b) Hickok oscilloscopes, models 1805 and 1805A, and (c) the three Lavoie oscilloscopes. Hickok and Jetronic do not challenge infringement by models USM/81 and 1805, but Jetronic says the claims are invalid for double patenting in light of the '904 and '905 patents.

It is hornbook patent law that only one patent can be granted for one invention. *Miller v. Eagle Mfg. Co.*, 151 U.S. 186, 197, 14 S.Ct. 310, 38 L.Ed. 121 (1894); *In re Siu*, 222 F.2d 267, 42 CCPA 864 (1955). Jetronic says that the '609, '904 and '905 patents disclose but two inventions, and they will not support three patents. The '905 patent (filed August 18, 1953) discloses a trigger-actuated sweep circuit, being made up of subcombination circuits including a sweep generator, disclosed in the '904 patent (filed August 18, 1953) and a multivibrator hold-off circuit, disclosed in the '609 patent (filed February 21, 1955, as a continuation-in-part of an earlier application filed August 18, 1953, later abandoned). R. L. Ropiequet is the inventor of the subject matter claimed in all three patents. The claims of the three patents, while necessarily directed to related subject matter, define distinct and separate inventions (a combination and two subcombinations); are not identical or substantially identical in scope; and thus do not define the same invention. *In re Stanley*, 214 F.2d 151 41 CCPA 956 (1954). It is well-established law that claims are not coextensive, and thus subject to double patenting, which simply define inventions which are combinations and subcombinations thereof. *Suffolk Co. v. Hayden*, 70 U.S. (3 Wall.) 315, 319, 18 L.Ed. 76 (1865); *Thomson-Houston Elec. Co. v. Elmira & Horseheads Ry.*, 71 F. 396 (2d Cir. 1896); *IV Walker Patents* § 266, at 181-2 (Deller's 2d ed. 1965). It is also pertinent to note that the original applications were all filed on the same day; that the Patent Office never questioned the propriety of prosecuting combination and subcombination claims in different applications; and that there is nothing in this record to suggest, contrary to Jetronic's contention, that filing the continuation-in-part application in 1955 on one of the subcombination inventions was intended to, or indeed has the effect of, illegally or inequitably extending any patent monopoly. Therefore, claims 1, 16 and 19 are valid and infringed by models USM/81 and 1805.

The United States, on behalf of Lavoie, does not challenge the validity of claims 1, 16 and 19, but both Hickok and the United States

deny infringement by Hickok model 1805A and the three Lavoie models. While the Hickok and Lavoie circuits in question have certain features different from the specific circuit described in the specification and shown in the drawings of the '609 patent, the differences do not avoid the claims, properly construed. Infringement is made out for reasons discussed in detail in findings 33 and 34. The accused circuits *331 operate in substantially the same way with substantially the same means to get substantially the same result.

Therefore, claims 1, 16 and 19 of the '609 patent are infringed by Hickok model 1805A and the three Lavoie models.

Findings of Fact

1. Plaintiff seeks recovery of reasonable and entire compensation under 28 U.S.C. § 1498 for unauthorized use by and manufacture for the United States of inventions described and claimed in eight U.S. patents. Plaintiff, an Oregon corporation with its principal place of business at Beaverton, Oregon, has been record owner of the patents in suit since their respective dates of issuance. The patents are identified in the accompanying table by number, subject title and patent claims here in suit. The table also lists the devices alleged to infringe.

Patents, Patent Claims, and Accused Devices

Patents	Claims	Hickok	Jetronic	Lavoie
3,061,788--Multivibrator Hold-Off Circuit . 2, 4		USM/81 1805	USM/81	LA265 LA265A LA545
2,769,905--Sweep Circuit 1, 5		USM/81 1805 1805A	USM/81	LA265 LA265A LA545
2,769,904--Gated Sweep Generator 1, 8		USM/81 1805 1805A	USM/81	LA265 LA265A LA545
2,853,609--Multivibrator Hold-Off Circuit . 1, 16, 19		USM/81 1805 1805A	USM/81	LA265 LA265A LA545
2,883,619--Electrical Probe 1, 6		1805		
2,930,986--Distributed Amplifier 1		1805		
2,826,694--Free-Running Multivibrator 2		USM/81	USM/81	
2,804,571--Unblanking Circuit 5, 8		USM/81	USM/81	

2. The patents relate to oscilloscopes and their electronic circuitry. Three of the Government's suppliers entered the suit as third-party defendants: The Hickok Electrical Instrument Company, doing business at Cleveland, Ohio; Jetronic Industries, Inc., doing business at Philadelphia, Pennsylvania; and Lavoie Laboratories, Inc., doing business at Morganville, New Jersey. On September 5, 1961; July 8, 1963; and July 25, 1963, respectively, the third-party defendants adopted the answer to plaintiff's petition, filed by the United States. All three third-party defendants were represented by counsel at the trial. Jetronic and Hickok submitted proposed findings and briefs with respect to oscilloscopes supplied by them to the Government. Lavoie is now bankrupt; and the defendant United States submitted proposed findings and a brief in its behalf.

3. On October 15, 1965, the court dismissed the Government's counterclaim for damages for alleged infringement by plaintiff of U.S. Patent 2,562,295 to Chance, and U.S. Patent 2,594,104 to Washburn, both owned by the United States. *Tektronix, Inc. v. United States et al.*, 351 F.2d 630, 173 Ct.Cl. 281.

4. Plaintiff was organized in 1946 and offered its first oscilloscope for sale in 1946 at prices considerably below those charged by other manufacturers. Tektronix Type 535 and Type 545 oscilloscopes, *332 which include the circuitry disclosed and claimed in the patents here in suit, resulted from 7 years of research and development by plaintiff. In 11 years, plaintiff's sales of these instruments were in excess of \$100 million.

5. Oscilloscopes are electronic measuring instruments used to inspect and analyze the characteristics of electrical signals, or the mechanical, chemical or biological events which produce them. In essence, the purpose of an oscilloscope is to produce a graph-like representation of such signals on a picture tube, akin to an ordinary TV picture tube. Oscilloscopes comprise three components: a cathode-ray tube; a horizontal circuit for producing on the tube a horizontal line representing time; and a vertical circuit for

producing variations in the horizontal line proportional to some event. A cathode-ray tube (like a TV picture tube) is a vacuum tube with a glass plate at one end, coated with a phosphor screen on the inside. The tube has a tapering bulb neck extending behind the screen. At the end of the neck and opposite the screen is an electron gun which generates a beam of electrons. The beam is directed against the screen, causing it to fluoresce and produce a spot of light wherever struck. The function of the horizontal and vertical circuits is to cause the spot of light to move on the screen in such manner as to permit observation and analysis of an electrical signal applied to the vertical circuit. The horizontal circuit causes the spot of light to move laterally across the screen from left to right at a uniform predetermined speed. Essentially, this is done by deflection plates which are placed near each side of the neck of the cathode-ray tube and between which the electron beam passes. By creating a voltage difference between the plates, the beam is made to deflect horizontally across the tube away from one plate and toward the other. The vertical circuit functions to move the spot up and down in response to variations of an electrical signal being analyzed. Deflection plates, similar to the ones noted above, are arranged near the top and bottom of the tube neck and function like the earlier-described plates. The spot of light persists on the screen for a short time after the electron beam moves on, the effect of which is to show a continuous line or trace during the time required for the spot to move from the left to the right side of the screen.

6. The horizontal circuitry of an oscilloscope is designed so that the speed at which the spot is moved across the screen can be adjusted, since it is desirable to be able to relate the horizontal speed of the spot to the speed at which changes are occurring in the electrical signal being analyzed. The number of times the spot moves across the screen per given time is called the repetition rate of the sweep. It is customary to construct the horizontal circuit so that a line or trace is not produced during the interval of time required to return the electron beam from the right side to the

left (or starting) side of the screen. Otherwise, the trace produced during the left-to-right sweep might be obscured. This is accomplished by a so-called unblanking circuit. All the patents and instruments with which this suit is concerned have unblanking circuits by which the electron beam is turned on (unblanked) at the beginning of the sweep and turned off (blanked) at the end of the sweep.

The fidelity of representation of the characteristics of a signal being examined depends upon the capability of the horizontal circuitry to produce a linearly rising voltage for application to the deflection plates to thereby deflect the electron beam, and upon the capability for unblanking the beam and causing each horizontal sweep to start at the same point on the screen. Also, the vertical circuitry must amplify the signal under examination without distorting it; and the signal itself must be applied to the vertical circuitry without being distorted. *333 In essence, proper operation of the oscilloscope requires that the representation on the screen of the signal under examination should not be distorted or affected by operation of the oscilloscope circuits themselves. The general purpose of the patents in suit is to meet this requirement for oscilloscopes which are of the wide band, wide sweep range, high intensity variety, and which are capable of displaying electrical signals of regular or random nature, whether of high-frequency, uniformly repetitive events, or single events of short or long duration.

7. The only issues before the court are patent validity and infringement. Accounting, if any, is deferred to later proceedings. Specific defenses relating to validity and infringement raised by the parties are discussed in the following findings with respect to each patent.

Patent 3,061,788

8. Patent 3,061,788 was granted to plaintiff on application Serial No. 761,570, filed September 17, 1958, by John R. Kobbe. The '570 application was a division of then-

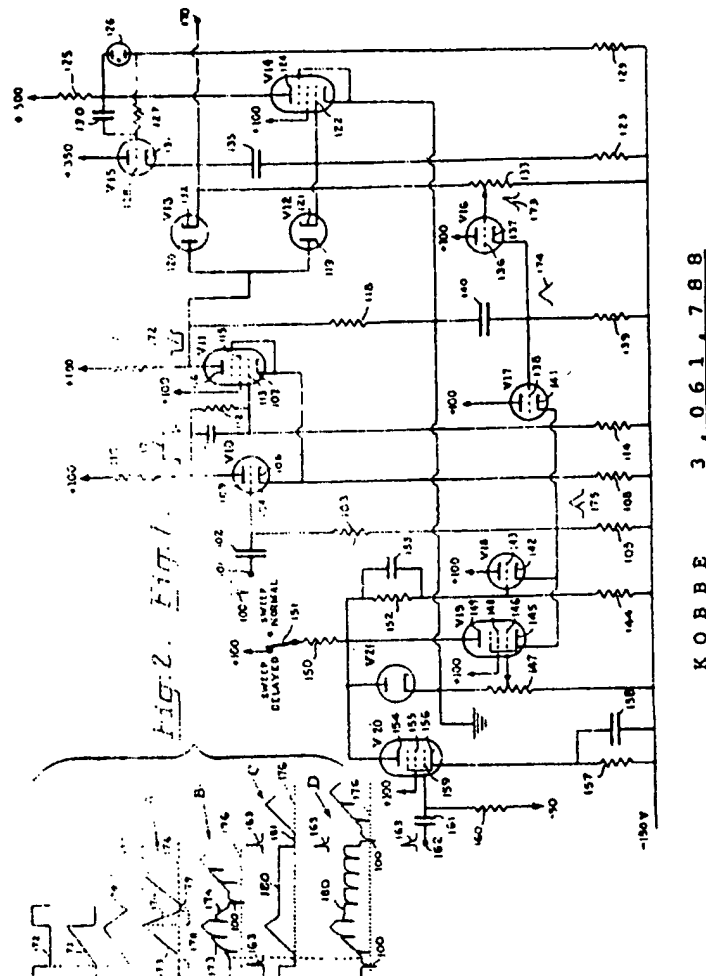
copending application Serial No. 489,614 (now U.S. Patent 2,853,609 to R. L. Ropiequet), filed February 21, 1955, as a joint application of R. L. Ropiequet and John R. Kobbe. The first Patent Office action, dated April 30, 1959, recognized the '570 application to be a proper division of the '614 application. Plaintiff alleges that claims 2 and 4 of the '788 patent are infringed by (a) Hickok and Jetronic oscilloscopes, model USM/81, (b) Hickok oscilloscope, model 1805, and (c) Lavoie oscilloscopes, models LA265, LA265A and LA545.

9. The '788 patent relates to the horizontal circuitry of an oscilloscope. In particular, it deals with the requirement of horizontal circuitry to produce a linearly rising voltage which deflects the electron beam (a) to produce the trace on the tube screen and (b) to cause each sweep of the beam to start at the same point on the screen. The aspect of these requirements with which the patent deals arises from the fact that the sweep generator, which creates the linearly rising voltage, and the sweep gating multivibrator, which controls the operation of the generator, contain components which do not immediately return to their initial (or quiescent) values after each operating cycle. The sweep generator and sweep gating multivibrator operate properly only if their circuits are actuated (or triggered) when their component parts have returned to the same resting condition (quiescent condition) at which they stood when the previous sweep was triggered. The '788 patent discloses a so-called hold-off circuit which prevents triggering of the multivibrator during the normal sweep cycle and until the components have returned to quiescent condition.

Briefly stated, the '788 patent describes oscilloscope circuitry in which the output of the sweep generator is applied to a hold-off circuit both (a) to revert the sweep gating multivibrator to a first stage and (b) to charge a hold-off timing capacitor in the hold-off circuit. The reversion and the hold-off are both accomplished by applying the output of the hold-off circuit to the same element of the multivibrator, the hold-off voltage being

applied after the reverting voltage has had its effect, the result being that the multivibrator is prevented from being triggered by a trigger signal for a preselected time interval following the reversion. The circuitry also includes a source of voltage which is mixed with the trigger signal voltage so that the amplitude of the trigger signal required to trigger the multivibrator may be varied; and, if desired, the source of voltage may be set so that the multivibrator is made to trigger even in the absence of a trigger signal, upon termination of the hold-off voltage. This arrangement simplifies and increases the reliability and versatility of the horizontal circuitry.

*334 10. In detail, and with reference to Figs. 1 and 2 of the drawing (reproduced herein) of the '788 patent, the patent describes a circuit comprising in essence a sweep gating multivibrator, a sweep generator and a hold-off circuit. The multivibrator consists of tubes V10 and V11. The tubes are connected to provide a bi-stable multivibrator which, in one state, produces a control voltage represented by the upper horizontal portion of waveform 172 and, in its other state, a control voltage represented by the lower horizontal line of waveform 172. In the resting (or quiescent) state, tube V10 is conducting and tube V11 is cut off, the multivibrator thereby producing the control voltage represented by the upper level of waveform 172.



The sweep generator comprises pentode V14, cathode follower V15 and diodes V12 and V13. A direct current degenerative feedback path is established between plate 124 and grid 122 of pentode V14 and includes cathode follower V15 and diodes V12 and V13. A capacitor 135 is also connected between the plate and grid of pentode V14; and it is across this capacitor that there is generated the linearly rising sweep voltage which is applied to terminal 170. The control voltage produced by the multivibrator is applied to the sweep generator circuit at a point (unnumbered in Fig. 1) between diodes V12 and V13. When the multivibrator changes from its first to its second state, as a result of a negative going trigger being applied to grid 104 of tube V10, the negative control voltage thereby produced by the multivibrator cuts off diodes V12 and

V13. Capacitor 135 thereupon charges at a constant rate and produces a linearly rising or sawtooth voltage which is applied to terminal 170. This sawtooth voltage is, in turn, applied to the deflection plates of the horizontal circuit of the cathode-ray tube (not shown), thereby to generate the electron beam horizontal sweep.

The sawtooth voltage is also applied to a hold-off circuit which includes cathode *335 followers V16 and V17. A time delay means comprising capacitor 140 and the resistor 139 is connected in the hold-off circuit between cathode 137 of tube V16 and grid 138 of tube V17. The output of the hold-off circuit is applied to grid 104 of tube V10 of the sweep gating multivibrator. The hold-off circuit, so arranged, applies a reverting voltage to the sweep gating multivibrator at the time it is

desired to terminate the sawtooth voltage; and also, thereafter, a hold-off voltage to prevent further actuation of the multivibrator until all components of the multivibrator and sweep generator circuits have returned to their quiescent values. This is accomplished in the following manner: The rising sawtooth voltage produced by the sweep generator is applied to grid 136 of cathode follower V16 through potentiometer 133. This causes a rise in voltage on cathode 137 of cathode follower V16 and, therefore, at grid 138 of cathode follower V17. At the same time, capacitor 140 begins to charge. The rise in voltage of grid 138 of V17 is transmitted to cathode 141, and this in turn raises the voltage of grid 104 of multivibrator tube V10 to the point where V10 begins to conduct. Tube V11 of the multivibrator is thereupon switched off, and the control voltage applied to the sweep generator is changed to its more positive level (upper level of waveform 172). Generation of the sawtooth voltage is thereupon terminated.

At this time, the voltage on grid 104 of tube V10 is at a level such that a negative going trigger pulse, such as 100, cannot drop it to the point where tube V10 will be cut off and V11 turned on so as to again trigger the sweep generator. The voltage on grid 104 is maintained above the level at which triggering can occur by action of the time delay means comprising capacitor 140 and resistor 139. As the sawtooth voltage begins to decay, the voltage levels on grid 136 of cathode follower V16 drops, while cathode 137 will be held up by capacitor 140, thereby cutting off tube V16. Capacitor 140 thereafter discharges through V17 and continues to do so for a period of time, depending upon the values of capacitor 140 and resistor 139, to hold the voltage on grid 104 above the level at which negative going trigger 100 can cut off tube V10. This interval is selected to exceed the time required for the components of the multivibrator and the sweep generator to return to their quiescent values. As the charge on capacitor 140 continues to decay, the voltage on grid 138 of V17 drops to the point where the tube becomes nonconductive and the complete circuit is thereupon returned to the condition wherein all components have

returned to their quiescent condition and the multivibrator can again be triggered by a negative going trigger such as 100.

The voltage of the trigger signal required to trigger the multivibrator can be adjusted by varying the direct current voltage (stability voltage) which is supplied to the portion of the circuit in which the trigger signals are mixed with the voltage produced by the time delay means. As the stability voltage is lowered, a lower level of negative going trigger voltage will serve to trigger the multivibrator after the hold-off voltage, produced by the time delay means, has had its effect. In fact, the stability voltage may be lowered to the point where, after the hold-off voltage, has dissipated, the multivibrator will be triggered even in the absence of a trigger signal since the stability voltage itself is then sufficiently negative to cut off tube V10. This is the setting used when employing the so-called free running mode of operation. The stability voltage is supplied from potentiometer 147 through cathode follower V19 to the trigger input circuit of multivibrator tube V10, comprising capacitor 102 and resistor 103, and thereby may be used to set the voltage of the trigger signal required to trigger the multivibrator.

*336 11. Claim 2 of the '788 patent defines a multivibrator hold-off circuit as follows:

2. A voltage generator circuit comprising: multivibrator means having first and second stable states for providing a first control voltage when in said first state and a second control voltage when in said second state, voltage generator means responsive to said control voltages for producing an output voltage which varies linearly from an initial value toward a second value when the multivibrator means changes from said first state to said second state and which rapidly returns to said initial value when the multivibrator means changes back to said first state, trigger signal input means for delivering trigger signals to said multivibrator to cause said multivibrator to change from said first state to said second state, feedback circuit means for feeding said

output voltage back to the multivibrator means to cause the multivibrator means to change back to said first state when said output voltage reaches said second value, and time delay means in said feedback circuit means for preventing the multivibrator means from again changing from said first state to said second state for a time delay after said output voltage has returned to said initial value.

In Fig. 1 of the '788 patent drawings, the 'multivibrator means' includes tubes V10 and V11 which provide a 'first control voltage' and 'second control voltage' (upper and lower levels of waveform 172). The 'voltage generator means' includes tubes V12, V13, V14, V15, and capacitor 135. The 'trigger signal input means' includes capacitor 102 connected to grid 104 of tube V10. The 'feedback circuit means' includes sweep voltage generator output terminal 170 connected to potentiometer 133, to tube V16, to tube V17, to resistor 103, to grid 104 of tube V10. The 'time delay means' includes capacitor 140 and resistor 139 connected to cathode 137 of tube V16.

12. Claim 4 of the '788 patent is similar to claim 2 and adds the following limitations: voltage mixing means associated with said multivibrator means, direct current feedback circuit means for delivering said output voltage to said mixing means in opposition to said trigger signals to cause said multivibrator means to change back to said first state when said output voltage reaches said second value, and adjustable voltage means for delivering a direct current adjustable voltage to said mixing means to set the voltage of the trigger signal required to trigger said multivibrator means including an adjustable voltage which will cause triggering of said multivibrator means after said time delay upon return of said output voltage to said initial value.

The 'voltage mixing means' includes capacitor 102, resistor 103, tube V10, resistor 112, capacitor 111, grid 113, and cathode 107 of tube V11. The 'direct current feedback circuit' includes sweep voltage generator output

terminal 170 connected to potentiometer 133, to tube V16, to tube V17, to resistor 103, to grid 104 of tube V10. The 'adjustable voltage means' includes potentiometer 147 connected between ground and -150 volts, to V19, to resistor 103, to grid 104 of tube V10.

13. Third-party defendant Hickok does not challenge plaintiff's assertion that claims 2 and 4 of the '788 patent are infringed by Hickok oscilloscope models USM/81 and 1805; nor has Hickok challenged the validity of claims *337 2 and 4. Accordingly, it is found that claims 2 and 4 of the '788 patent are infringed by Hickok models USM/81 and 1805.

14. Third-party defendant Jetronic asserts that claims 2 and 4 of the '788 patent are invalid over Fig. 4 of plaintiff's prior filed '905 patent. The '905 patent was cited and considered by the Patent Office during prosecution of the '788 patent, and the '788 patent was allowed thereover. Based on the testimony of plaintiff's expert, Knapton, and Jetronic's expert, Weinger, and the Patent Office file history of the '788 patent, claims 2 and 4 are neither anticipated by, nor obvious in view of the disclosure of the '905 patent; and the claims are therefore not invalid. Jetronic does not challenge plaintiff's assertion of infringement of claims 2 and 4 by Jetronic USM/81 oscilloscope circuitry. Therefore, claims 2 and 4 are infringed.

15. Lavoie oscilloscopes LA265, LA265A and LA545 employ circuitry materially the same as that disclosed and claimed in patent '788. Defendant United States, however, asserts that such oscilloscopes use three tubes in the multivibrator rather than two tubes, as described in the '788 patent; and that the multivibrator has three stable states rather than two. The Lavoie multivibrator, even assuming a third stable state, still meets the claim limitation of having a 'first' and 'second' stable state, and it performs the claimed function of providing first and second control voltages. In all respects here material, therefore, the Lavoie multivibrator operates in substantially the same way, using substantially the same means, to get substantially the same result as the claimed

device.

Defendant also asserts that by reason of statements and claim amendments made in the Patent Office in the '788 patent application file, plaintiff is estopped from construing claims 2 and 4 to cover the Lavoie oscilloscopes which, as noted above, have three stable states in the multivibrator. The prior art over which the claims distinguish shows a multivibrator having a single stable state. Such prior art raises no estoppel in favor of Lavoie's circuit since Lavoie does not use a multivibrator with a single stable state but rather one in all material respects equivalent to the claimed device.

Defendant further contends that claim 4 of the '788 patent is not infringed because the Lavoie circuit does not deliver the output voltage of the direct current feedback circuit to a signal 'mixing' means as required by the claim, but rather delivers it directly to the gate tube of the multivibrator. The expert testimony is not entirely clear in distinguishing 'gating' and 'mixing.' However, the weight of the evidence shows that irrespective of whether 'mixing' or 'gating' is involved, the Lavoie circuit operates in substantially the same way to get substantially the same result, and is therefore the equivalent of the claimed circuit.

Defendant United States does not challenge the validity of the '788 patent. [FN3] Therefore claims 2 and 4 of the '788 patent are infringed by the Lavoie LA265, LA265A, and LA545 oscilloscopes.

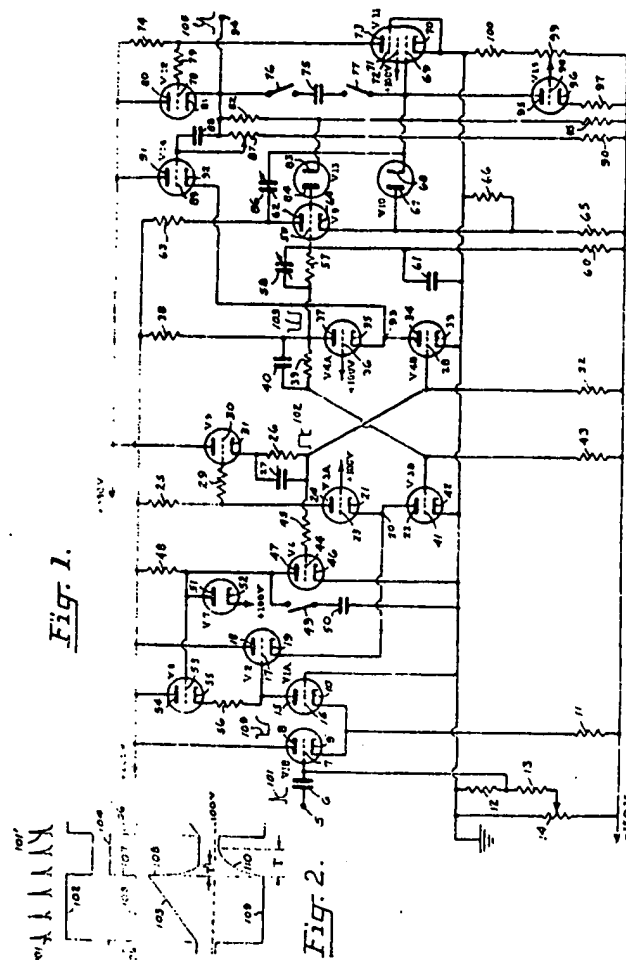
FN3. See note 2, supra. (footnote by the court).

Patent 2,769,905

16. Patent 2,769,905 was granted to plaintiff on application Serial No. 374,957, filed on August 18, 1953, by Richard L. Ropiequet. The '905 patent issued November 6, 1956. It relates to sweep circuits, particularly to a circuit for producing a sawtooth waveform of precise configuration. Plaintiff alleges that claims 1 and 5 of the '905 patent are infringed by (a) Hickok and

Jetronic oscilloscopes, model USM/81, (b) Hickok oscilloscopes, models 1805 and 1805A, and (c) Lavoie oscilloscopes, models LA265, LA265A and LA545.

17. The '905 patent describes a sweep circuit which includes a multivibrator, *338 a sweep generator and a multivibrator hold-off circuit. With reference to Figs. 1 and 2 of the patent drawing (reproduced herein), the multivibrator includes tubes V3A, V3B, V4A, V4B, and V5. The sweep generator includes tubes V9, V10, V11, V12, V13, V14, and V15. The multivibrator hold-off circuit includes tubes V1A, V1B, V2, V6, V7, and V8. In the quiescent condition, multivibrator tubes V3A and V3B are conducting and tubes V4A and V4B are nonconducting. The plate circuit of multivibrator tube V4A supplies two control voltages to the sweep generator, a higher voltage level (upper level of waveform 103) when the multivibrator is in its quiescent condition with tubes V3A and V3B conducting, and a lower level (lower level of waveform 103) which turns on the sweep generator and continues until the multivibrator is reverted to its quiescent condition.



ROPIEQUET 2,769,905

The sweep generator includes a direct-coupled feedback loop around tube V11. This feedback loop starts at plate 73 of tube V11 and goes through resistor 79 to cathode follower V12 to the sweep output terminal 94. It also passes through a voltage divider consisting of resistors 82 and 85 to diode tube V13. Diode tube V13 is connected to the grid of cathode follower V9, and the cathode of tube V9 is connected to the plate of diode V10. The cathode of V10 is, in turn, connected to the control grid 69 of tube V11. plate 73 of tube V11 in which the sweep output sawtooth voltage is produced, is also connected to grid 89 of cathode follower V14; and the output of tube V14, at its cathode 92, is connected back into the multivibrator at cathode *339 35 of tube V4A. Cathode follower V14 is thus cut off when the circuit is in its quiescent condition.

When in its quiescent condition, the circuit may be triggered in the following manner: A positive pulse 101 applied to terminal 5 is passed through cathode follower V1B to grounded grid amplifier V1A and thence to junction 20 of cathode 21 of V3A and plate 22 of V3B. The positive voltage arriving at junction 20 cuts off the current flow in V3A, thus causing a voltage rise in its plate circuit which is passed through cathode follower V5 to the grid of multivibrator tube V4B. This positive pulse causes V4B and V4A to conduct, thus causing the control voltage produced in the plate circuit of V4A to drop to its lower level. This lower level of control voltage is coupled to the sweep generator through resistance 57 to grid 59 of cathode follower V9 and thence to plate 67 of diode V10. Diode V10 is thereupon cut off, thus interrupting the

feedback loop around tube V11, and a linearly rising sweep voltage (sawtooth voltage) is then generated across capacitor 75. This sawtooth voltage is represented by waveform 105 appearing above terminal 94. When the sawtooth voltage has risen to a desired value, cathode follower V14 begins to conduct, and a positive voltage produced at its cathode 92 is applied to junction 93 of cathode 35 of tube V4A and plate 34 of tube V4B. This acts to cut off tube V4A, and hence tube V4B, and the rising plate voltage of V4A is applied to the grid of V3B to cause V3B, and hence V3A, to again conduct. The multivibrator is thus reverted to its initial condition and, subject to the effect of the hold-off circuit (below discussed), is again ready for further triggering.

The effect of the hold-off circuit is to prevent a trigger pulse from triggering the multivibrator for a period of time which is long enough for the sweep circuit to recover fully. The hold-off circuit includes capacitor 50 and resistor 48. During the generation of a sweep, when the plate circuit of multivibrator tube V4A is producing the lower of its two control voltages, tube V6 is conducting and capacitor 50 may discharge therethrough. The voltage in the plate circuit 24 of multivibrator tube V3A drops when the multivibrator is reverted at the end of a sweep, and this negative voltage is applied to grid 44 of tube V6 through resistor 45 and turns off the tube. The hold-off capacitor 50 thereupon charges through resistance 48, and the increasing voltage thus produced is applied to grid 53 of cathode follower V8, the output of which is applied to grid 17 of V2. As capacitor 50 continues to charge, it causes an increase in the voltage on grid 53 of tube V8. This increased voltage is passed through resistance 56 to grid 17 of V2. Any increase in voltage on the grid of V2 will cause an increase in voltage at junction 20 of multivibrator tubes V3A and V3B. As capacitor 50 charges gradually to its quiescent value, the voltage on the grid 17 of V2, and consequently at the junction 20, increases to the point where the addition of a trigger signal thereto will cause the voltage at junction 20 to increase to the point where the tubes V3A and V3B will be

cut off, and the multivibrator thus triggered. Triggering cannot occur until the voltage at junction 20 reaches its quiescent value, and the length of this hold-off period is determined by the values of capacitor 50 and resistor 48.

18. Claim 1 of the '905 patent defines a trigger-actuated sweep circuit as follows:

1. A trigger-actuated sweep circuit comprising
a multivibrator,
a sweep generator including an electron discharge device having a grid and a plate,
a capacitance,
means connecting the capacitance *340 between said grid and plate,
means connecting said grid to a source of potential,
degenerative direct current feedback means connected between said grid and plate and including a pair of series connected diodes,
means connecting the multivibrator between said diodes,
means connecting the sweep generator electron discharge device output to the multivibrator,
a resistance-capacitance network,
means connecting said network to the multivibrator, and
signal mixing means connecting said network and a trigger source to the multivibrator.

Claim 5 of the '905 patent further defines the sweep circuit as follows:

5. A trigger-actuated sweep circuit comprising
a multivibrator,
a sweep generator including an electron discharge device having a grid and a plate,
a capacitance,
cathode follower means connecting the capacitance between said grid and plate,
means connecting said grid to a source of potential,
degenerative direct current feedback means connected between said grid and plate and including a pair of series connected diodes,
means connecting the multivibrator between said diodes,

second cathode follower means connecting the sweep generator electron discharge device output to the multivibrator, a resistance-capacitance network, means connecting said network to the multivibrator, and signal mixing means connecting said network and a trigger source to the multivibrator.

Claims 1 and 5 are supported by the disclosure noted in finding 17.

19. Plaintiff asserts that Hickok models USM/81, 1805 and 1805A infringe claims 1 and 5 of the '905 patent. Hickok does not challenge the validity of the claims. Hickok's requested findings with respect to infringement relate to Hickok model 1805A. The sweep circuits of model 1805A are substantially the same as the circuits claimed in the '905 patent, except that they use a diode and a pentode V260B, connected as a grounded grid amplifier, to the feedback circuit of the sweep generator, rather than a 'pair of series connected diodes' as claimed in claims 1 and 5. Hickok alleges that infringement is thereby avoided. A pentode is a five-element vacuum tube and a diode is a two-element vacuum tube. Hickok's technical expert testified that the purpose in using the V260B pentode in Hickok model 1805A was to provide satisfactory performance without the use of diodes 'since the latter is covered by one of plaintiff's patents.' The Hickok expert also stated that one aspect of the pentode serves to overcome a disadvantage produced by another aspect of the pentode; that the diode circuit and the pentode circuit both function to actuate the sweep circuit; that mixing of hold-off and trigger signals in the 1805A accomplishes synchronization; and that if the '905 patent had not been in question, he would have been happy to use a diode in place of the pentode. While the pentode provides some amplification in the feedback circuit not obtained with a diode, the evidence does not show that such amplification is significant and material in the circuit in question; and, in essence, the pentode functions as a diode for the purposes here material. Accordingly, it is found that the substitution of *341 a pentode connected as a grounded grid amplifier for a

diode does not substantially change the operation of the sweep circuit as defined in claims 1 and 5 of the '905 patent; that the Hickok model 1805A circuit uses substantially the same means in substantially the same way to get substantially the same result as the claimed circuits; and that the patent claims are therefore infringed. Hickok does not challenge plaintiff's assertion of infringement of claims 1 and 5 by Hickok models 1805 and USM/81. Models 1805, 1805A and USM/81 therefore infringe claims 1 and 5.

20. Plaintiff asserts that Jetronic oscilloscope model USM/81 infringes claims 1 and 5 of the '905 patent. The Jetronic USM/81 circuitry is substantially the same as the circuits of claims 1 and 5. However, Jetronic contends that the USM/81 does not have 'means connecting the multivibrator between said diodes,' as called for in claims 1 and 5. Such means is found in the USM/81 circuitry as a connection from the multivibrator to the cathode of one of the diodes, which in respects here material is equivalent to the claimed structure. Jetronic also contends that the USM/81 does not include four separate external connections to the multivibrator, as shown in the circuit disclosed in the '905 patent drawing. Claims 1 and 5 do not recite and require separate connections, do not state that the connections must be to separate points in the multivibrator, and are not restricted to the exact circuitry illustrated in Fig. 1 of the '905 patent drawings. Jetronic also contends that the USM/81 has no 'means connecting said network (the resistance-capacitance network) to the multivibrator.' It is found that there is such means in the USM/81 circuit which is not coextensive with and which is not the same element or group of elements corresponding to any other means recited in the patent claims. Accordingly, claims 1 and 5 of the '905 patent are infringed by the Jetronic USM/81 oscilloscope.

21. Defendant United States contends that Lavoie oscilloscopes, models LA265, LA265A and LA545, do not infringe claims 1 and 5 of the '905 patent. The Lavoie circuitry is substantially the same as the circuits of claims 1 and 5, except that in the Lavoie circuitry, a

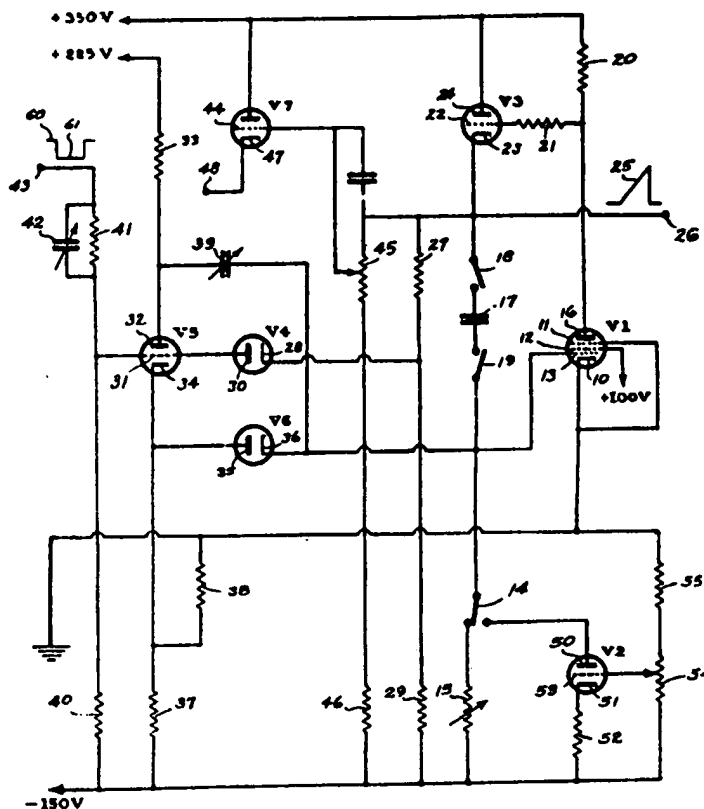
grounded grid triode, a three-element tube, is substituted for one of the 'pair of series connected diodes' as claimed in claims 1 and 5, and for the pentode of the Hickok circuitry (finding 19). A triode, like a pentode, includes elements which are common to a diode. The evidence shows that the Lavoie circuitry uses a triode primarily for its diode functions. Any other advantages, particularly amplification in the feedback circuit, realized from the substitution of the Lavoie triode or the Hickok pentode for the Tektronix diode are of negligible or questionable value in the operation of the circuits here in issue, and the essential operating features of all the circuits are the same. The Lavoie oscilloscope circuits therefore are in all material respects the same as those defined in claims 1 and 5 since they operate in substantially the same way with substantially the same means to get substantially the same result. Accordingly, claims 1 and 5 of the '905 patent are infringed by the Lavoie LA265, LA265A and LA545 oscilloscope circuitry.

Patent 2,769,904

22. Patent 2,769,904 was granted to plaintiff on application Serial No. 374,958, filed August 18, 1953, by Richard L. Ropiequet. The '904 patent issued November 6, 1956. It relates to sawtooth generator circuits. Plaintiff alleges that claims 1 and 8 of the patent are infringed by (a) Hickok and Jetronic oscilloscopes, model USM/81, (b) Hickok oscilloscopes 1805 and 1805A, and (c) Lavoie oscilloscopes, models LA265, LA265A and LA545.

23. The circuit of the '904 patent is a subcombination of the circuit described in Fig. 1 of the '905 patent (finding 16), and its construction and *342 operation are described in finding 17. Briefly, and with reference to the drawing of the '904 patent (reproduced herein), the circuit includes a o-called Miller tube V1 with a timing capacitor 17 connected between the tube's grid 13 and plate 16. A timing resistor 15 is connected at one end to a -150 volt supply and at its other end to the grid of the Miller tube. A degenerative direct current feedback loop extends also from plate

16 to grid 13. The loop includes cathode follower V3, resistor 27, diode V4, cathode follower V5, and diode V6, the cathode of which is connected to grid 13. The circuit operates like the sweep generator, described in finding 17.



ROPIEQUET 2,769,904

24. Claim 1 of the '904 patent reads as follows:

1. A sweep generator adapted to be actuated by a gate source and comprising
an electron discharge devise having a grid and plate,
a capacitor connected between said grid and plate,
resistance means connecting the grid to a source of potential,
degenerative direct current feedback means connected between the grid and plate and including a pair of series-connected diodes, and
*343 means for connecting a gate source between said diodes.

Claim 1 is supported by the disclosure noted in finding 23.

Claim 8, similar to claim 1, includes as an

additional limitation 'cathode follower means connecting the plate to the gate source, whereby to utilize the generated sweep to terminate the gate and the sweep.' The 'cathode follower means,' connected as described, is tube V3 which has its grid 22 connected to plate 16 of tube V1, and its cathode 23 connected to the gate source through potentiometer 45 and cathode follower V7. Cathode 47 of V7 is connected to terminal 48 which in turn is connected to the sweep gating multivibrator. This connection makes it possible to utilize the sweep to terminate the gate and the sweep.

25. Plaintiff asserts that Jetronic oscilloscope, model USM/81, infringes claims 1 and 8 of the '904 patent. The USM/81 circuitry is substantially the same as the circuits of claims 1 and 8. However, Jetronic contends that the claims are not infringed

because the USM/81 does not have 'means connecting the multivibrator between said diodes,' as called for in claims 1 and 8. As noted in finding 20, the USM/81 has such means as a connection from the multivibrator to the cathode of one of the diodes, which in respects here material is equivalent to the claimed structure. Claims 1 and 8 of the '904 patent therefore are infringed by the Jetronic USM/81 oscilloscope. Jetronic does not challenge the validity of the claims, except to the extent they are challenged by Hickok (finding 26).

26. Plaintiff asserts that Hickok models USM/81, 1805 and 1805A infringe claims 1 and 8 of the '904 patent. Hickok's requested findings with respect to infringement relate to Hickok model 1805A. Hickok denies infringement for essentially the same reasons noted in finding 19 with respect to the '905 patent; and for the same reasons stated in finding 19, it is found that the Hickok model 1805A circuit uses substantially the same means in substantially the same way to get substantially the same result as the claimed circuits. Claims 1 and 8 are therefore infringed by Hickok model 1805A. Hickok does not challenge plaintiff's assertion of infringement of claims 1 and 8 by Hickok models 1805 and USM/81. Such models therefore infringe claims 1 and 8.

Hickok challenges the validity of the '904 patent on the basis of several prior art patents and publications, particularly a Waveforms Textbook Publication and British patent 645,691 to F. C. Williams, the author of the Waveforms reference. The Waveforms reference was cited and relied on by the Patent Office during prosecution of the '904 patent. The expert testimony at trial with respect to the prior art, including the British patent, shows no error by the Patent Office in granting the claims. Accordingly, claims 1 and 8 are neither anticipated by nor obvious in view of the prior art.

27. Defendant United States contends that Lavoie oscilloscopes, models LA265, LA265A and LA545, do not infringe claims 1 and 8 of the '904 patent. Defendant's arguments are

essentially the same as noted in finding 21; and for the same reasons stated therein, Lavoie models LA265, LA265A and LA545 infringe claims 1 and 8. Defendant does not challenge the validity of the '904 patent.

Patent 2,853,609

28. Patent 2,853,609 was granted to plaintiff on application Serial No. 489,614, filed February 21, 1955, by Richard L. Ropiequet. The '609 patent issued September 23, 1958. It relates to a multivibrator hold-off circuit. Plaintiff alleges that claims 1 and 16 of the '609 patent are infringed by the main and delaying sweep circuitry of (a) Hickok and Jetronic oscilloscopes, model USM/81, (b) Hickok oscilloscopes, models 1805 and 1805A, and (c) Lavoie oscilloscopes, models LA265, LA265A and *344 LA545; and that claim 19 is infringed by the main sweep circuitry of the above-noted oscilloscopes.

29. The '609 patent describes a circuit which functions to prevent a multivibrator in an oscilloscope circuit from being triggered for a predetermined time after reversion by maintaining a control element at a level of potential such that triggering cannot occur. The control elements also functions to control the stability of the multivibrator.

With reference to Figs. 1 and 2 of the patent (reproduced herein), a multivibrator having terminals 21 and 34 is illustrated diagrammatically. The multivibrator is triggered by a pulse 40 which passes through capacitor 11, cathode follower V1B, grounded grid amplifier V1A and cathode follower V2, the output of which is applied to terminal 21 of the multivibrator. This pulse causes the multivibrator to change from its quiescent condition, or first stable state, to a second stable state. The output of the multivibrator, taken at terminal 34, is applied to grid 33 of tube V4B. When the multivibrator changes to its second stable state, the positive going waveform, represented by 41, cause V4B to conduct. This permits timing capacitor 35 to discharge and thus lower the voltage on grid 27 of cathode follower V3 which, in turn, lowers the voltage at cathode 24 of V3 and,

therefore, on grid 19 and cathode 20 of V2. Thus, a trigger pulse 40, arriving at this time through cathode follower V1B and grounded grid amplifier V1A at the grid of V2, will not raise the voltage level of grid 19 and cathode 20 of V2 sufficiently high to trigger the multivibrator. The multivibrator accordingly remains in the second stable state during the generation of a sawtooth voltage by a voltage generator (not shown) and is reverted to its first stable state when the sawtooth voltage reaches its desired maximum value. After reversion, however, the multivibrator will be prevented from again being triggered until grid 19 and cathode 20 of V2 are again raised to a potential which, with the addition of that of the trigger pulse 40, is sufficiently positive to trigger the multivibrator. This occurs when the multivibrator reverts to its first stable state and V4B is cut off. Timing capacitor 35 thereupon charges through resistor 30 and gradually raises the voltage level on grid 27 and cathode 24 of V3, and consequently upon grid 19 and cathode 20 of V2. The time required to thus raise these voltage levels depends upon the particular values selected for capacitor 35 and resistor 30, and this time interval is selected so as to exceed the recovery time of the circuits. At the expiration of the recovery time, a trigger pulse 40 can again trigger the multivibrator.

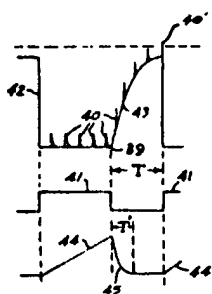


Fig. 2.

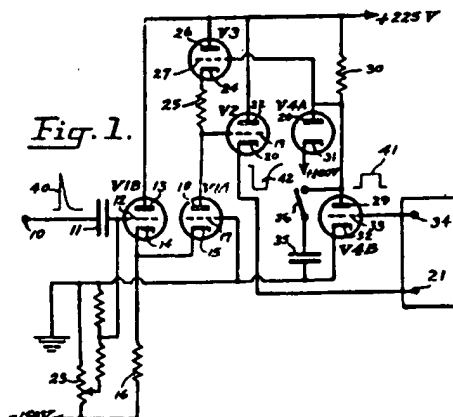


Fig. 1.

ROPIEQUET 2,853,609

30. Claims 1, 16 and 19 of the '609 patent

define a multivibrator circuit as follows:

1. A multivibrator characterized by having a recovery time after reversion and comprising a triggering control element, direct current circuit means connected to the triggering control element for supplying electric potential to the latter, a signal producing element at which an electric signal is produced upon triggering of the multivibrator, the multivibrator being triggered at a predetermined level of potential *345 of the triggering control element, the triggering control element being removed from said triggering potential upon triggering of the multivibrator and returned toward said triggering potential upon reversion of the multivibrator, and timed delay means in the said direct current circuit means for delaying the return of the triggering control element toward said triggering potential for a predetermined time after reversion of the multivibrator and exceeding said recovery time.

16. In combination with a trigger signal source and a multivibrator characterized by having a recovery time after reversion and having a triggering control element and direct current circuit means connecting the control element to a source of potential, and wherein the multivibrator has a normal quiescent level of potential and is triggered at a predetermined level of potential of said control element removed from said quiescent level and wherein said control element is removed from said quiescent level upon triggering of the multivibrator and is returned to said quiescent level upon reversion of the multivibrator, the multivibrator also including a signal producing element at which an electric signal is produced upon triggering of the multivibrator:
means for preventing triggering of the multivibrator for a predetermined time after reversion of the multivibrator and exceeding the recovery time of the latter, comprising timed delay means in the said direct current circuit means for delaying for a

predetermined time the return of the control element to said quiescent level upon reversion of the multivibrator, means conductively connecting the signal producing element to the time delay means for actuating the latter by said electric signal, and means connecting the trigger signal source to the multivibrator at a position associated with the triggering control element to effect mixing of the trigger signal and the control potential, the trigger signal functioning to return said triggering control element to the triggering level after the delayed return of the control element to its normal quiescent level of potential.

19. The device of claim 16 wherein the timed delay means includes a trigger actuated hold-off multivibrator and a source of external triggers therefor.

31. The '609 patent issued on an application filed by Richard L. Ropiequet and John R. Kobbe on February 21, 1955. The application was stated to be a continuation-in-part of application Serial No. 374,849, filed August 18, 1953, by Richard L. Ropiequet alone and later abandoned. Prior to any Patent Office action, the applicants filed a letter on March 14, 1955, making reference to an interview with the patent examiner during the preceding November at which prior art patent U.S. 2,661,421 to Talamini was discussed. Applicants pointed out that their invention distinguished over Talamini on the grounds that external trigger signals may be applied directly to the multivibrator at all times without affecting triggering of the multivibrator until the control element thereof is returned to a potential at which the trigger signals may be effective. In March 1955, the application included claims 17 and 20, which eventually became patent claims 16 and 19, respectively.

*346 In a Patent Office action dated December 27, 1956, the examiner cited U.S. Patent 2,562,295 to Chance, one of the prior art patents relied upon by defendants in this case, and rejected application claim 17 as

'fully met' by Chance. Chance teaches a multivibrator which is triggered by pulses and includes means for blocking the pulses for a desired predetermined time. In an answering letter dated February 26, 1957, applicants traversed the rejection, pointing out that Chance is similar in all material respects to the Talamini patent since both patents teach means which provide, in a stage preceding the multivibrator, the blocking of input trigger signals to the multivibrator. Applicants' invention, on the other hand, provides a triggering control element which prevents triggering of the multivibrator for a predetermined time, even in the presence of trigger signals. Applicants noted that Chance does not remove the triggering control element of the multivibrator from its triggering potential, but rather eliminated the trigger signal itself.

Claim 1 of the '609 patent was application claim 27, and was added by an amendment dated September 26, 1957. The claim was allowed substantially as filed. Patent claims 1, 16 and 19, among others, were allowed on May 3, 1958.

On September 17, 1958, just before issuance of the patent, applicants filed a request in the Patent Office to delete the name of John R. Kobbe as co-inventor on the application. Applicants also requested that application claim 11 (patent claim 10) be canceled. This led to disclaimer of claim 10, published in the Patent Office Official Gazette of February 17, 1959 and the certificate of correction dated March 17, 1959, deleting the name of John R. Kobbe from the patent as a joint inventor.

32. Plaintiff asserts that Jetronic oscilloscope, model USM/81, infringes claims 1, 16 and 19 of the '609 patent. Jetronic does not challenge infringement, but contends that claims 1, 16 and 19 are invalid on grounds of double patenting in view of the claims of the '904 and '905 patents. The '905 patent (filed August 18, 1953) discloses a trigger-actuated sweep circuit, being made up of subcombination circuits including a sweep generator disclosed in the '904 patent (filed August 18, 1953) and a multivibrator hold-off

circuit disclosed in the '609 patent (filed February 21, 1955 as a continuation-in-part of an earlier application filed August 18, 1953, later abandoned). R. L. Ropiequet is the inventor of the subject matter claimed in all three patents. The claims of the three patents, while necessarily directed to related subject matter, define distinct and separate inventions, and not identical or substantially identical, and thus are not invalid for double patenting. Nor are the patent disclosures prior art with respect to one another since they were all filed on the same date, were copending, and have the same inventor. Claims 1, 16 and 19, therefore, are valid and infringed by the Jetronic oscilloscope, model USM/81.

33. Plaintiff asserts that Hickok models USM/81, 1805 and 1805A infringe claims 1, 16 and 19 of the '609 patent. Hickok does not challenge the validity of the claims (other than adopting Jetronic's challenge, finding 32). Hickok's requested findings with respect to infringement relate to Hickok model 1805A. The model 1805A circuitry is materially similar to the claimed circuitry. Hickok contends, however, that the operation of model 1805A differs from the claimed circuit in that the hold-off circuit is part of the multivibrator circuit (rather than being external to it) and that, accordingly, the hold-off time and recovery time of the multivibrator after reversion are equal, thereby avoiding the limitation in claims 1, 16 and 19 that the 'timed delay means' delays the return of the triggering control element 'for a predetermined time after reversion of the multivibrator and exceeding said (multivibrator) recovery time.' *347 (Emphasis added.) Based on the patent disclosure and expert testimony, the multivibrator recovery time does not include the hold-off time, and accordingly the hold-off time in the Hickok circuits exceeds the multivibrator recovery time, within the meaning of the claims. The Hickok circuitry therefore comes within the terms of the claims; and in all respects, the model 1805A circuitry operates in substantially the same way with substantially the same means to get substantially the same result. Hickok does

not challenge plaintiff's assertion of infringement of claims 1, 16 and 19 by Hickok models 1805 and USM/81. Accordingly, Hickok models 1805, 1805A and USM/81 infringe claims 1, 16 and 19.

34. Defendant United States contends that Lavoie oscilloscopes, models LA265, LA265A and LA545, do not infringe claims 1, 16 and 19 of the '609 patent. Defendant does not challenge the validity of the claims. The Lavoie oscilloscope circuitry is materially similar to the claimed circuits. Defendant contends, however, in essence, that the grid of tube V233B in the Lavoie circuit is the 'triggering control element' of the claimed circuit; and that, accordingly, the claims are not infringed because such grid does not function as required by other limitations in the claims. Plaintiff, on the other hand, contends that the 'triggering control element' in the Lavoie circuits is tubes V235A and V245A which function together in the circuit to meet all the claim limitations. The evidence supports plaintiff. While Lavoie uses two tubes in place of one tube V2 in the circuit described in the '609 patent, Lavoie's tubes and circuit are in all material respects equivalent to the claimed circuit and do substantially the same thing in substantially the same way to get substantially the same result. Nothing in the claim language or its interpretation in light of the file history of the '609 patent requires that the 'triggering control element' be a single tube; and, indeed, the patent specification suggests otherwise. Prior art circuits, viz. Chance and Talamini, are not the equivalent of either the Lavoie circuits or the claimed circuit. Claims 1, 16 and 19, therefore, are infringed by the Lavoie LA265, LA265A and LA545 oscilloscopes.

Patent 2,883,619

35. Patent 2,883,619 was granted to plaintiff on application Serial No. 568,584, filed February 29, 1956, by John R. Kobbe and William J. Polits. The patent issued April 21, 1959. It relates to electrical probes for transmitting signal voltages from a circuit under test to a wideband amplifier without distorting the signal. Plaintiff alleges that

claims 1 and 6 of the '619 patent are infringed by instrument probes used with Hickok oscilloscope, model 1805.

Hickok requests no findings that the claims are invalid or not infringed. Accordingly, claims 1 and 6 are infringed by the accused instrument probes.

Patent 2,930,986

36. Patent 2,930,986 was granted to plaintiff on application Serial No. 568,489, filed February 29, 1956, by John R. Kobbe and William J. Polits. The patent issued March 29, 1960. It relates to distributed amplifiers. Plaintiff alleges that claim 1 of the '986 patent is infringed by Hickok oscilloscope, model 1805.

Hickok requests no findings that the claim is invalid or not infringed. Accordingly, claim 1 is infringed by Hickok model 1805.

Patent 2,826,694

37. Patent 2,826,694 was granted to plaintiff on application Serial No. 493,317, filed March 10, 1955, by R. L. Ropiequet. The '694 patent issued March 11, 1958. It relates to a so-called free-running multivibrator for use with a sweep generator circuit in an oscilloscope. Plaintiff alleges that claim 2 of the '694 *348 patent is infringed by Hickok and Jetronic oscilloscopes, model USM/81.

38. The '694 patent describes a multivibrator for use with a sweep generator circuit in an oscilloscope. The multivibrator is capable of 'free-running', i.e., operating without the application of external trigger signals. The multivibrator is called a cathode-coupled bistable multivibrator. It has two states of operation and may be switched into either state, remaining in the switch state until actuated to return to the original state.

With reference to Fig. 1 of the patent drawing (reproduced herein), the multivibrator comprises tubes V1 and V2 whose respective cathodes, 8 and 9, are connected together. Plate 17 of tube V1

connects through a resistor-capacitor network 18, 20 to grid 16 of tube V2. Grid 16 is connected through resistor 26 to grid 13 of tube V1. Resistor 26 and capacitor 14, shown connected at its one end to resistance 15, constitute a resistance-capacitance network which defines the switching time constant for the multivibrator.

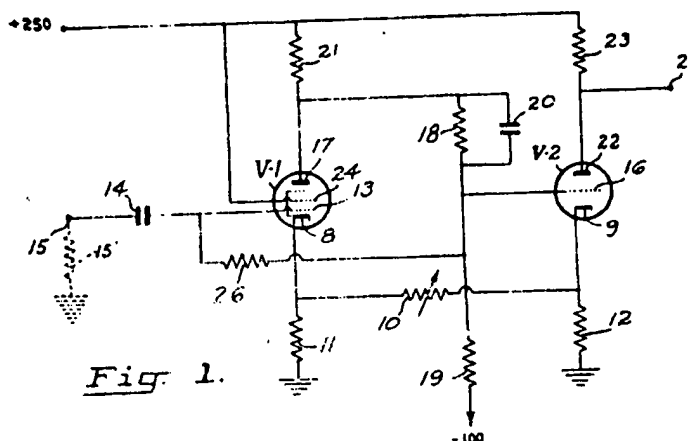


Fig. 1.

ROPIEQUET 2,826,694

The circuit above-described is used as a trigger circuit for an oscilloscope. It serves to receive voltages of varying magnitude and shape and to form them into square waves suitable for triggering a sweep generator such as described in the '788 patent there in suit. The circuit operates in a free-running mode by which the grid of one of tubes V1 or V2 is automatically returned toward its triggering level each time the multivibrator switches, so that the circuit will 'free-run' and produce a sweep on the oscilloscope even though no external trigger pulses are present to trigger the multivibrator. Very small trigger pulses can also control the instrument so as to trigger the multivibrator in synchronization with such small pulses.

In free-run operation, the circuit operates as follows: With power applied to the circuit, one or the other of tubes V1 or V2 will conduct, and the other will be nonconducting. Assume V2 is conducting. This will cause a positive voltage on its cathode 9 which, coupled across resistor 10 to cathode 8 of V1, would produce

enough positive voltage at the cathode of V1 to keep V1 cut off. A positive voltage also appears on grid 16 of V2, which originates from the plate of V1, since V1 is cut off. This positive voltage turns on V2, and also tries to turn on V1 through grid-connected resistor 26. Resistor 26 and capacitor 14 constitute an RC (resistor-capacitor) time constant circuit and control the voltage on grid 13 so that it rises gradually. Eventually, grid 13 of V1 becomes positive enough so that V1 conducts. When V1 begins to conduct, there is a negative change at its plate which is coupled to grid 16 of V2, which tends to cut off V2. That tends to reduce or make the voltage go negative which is present in the case of both tubes, since it has been the current in V2 that has made them go positive. This negative voltage on the cathode turns on V1 even harder, which reinforces the whole action so the current switches over into V1. The current in V1 keeps its plate much more negative than it was in the other state, thereby keeping V2 cut off through the divider-resistor 18 and 19; and the same negative voltage, from the plate of

V1, also tries to make grid 13 of V1 go negative but again the resistance of resistor 26, together with capacitor 14, prevents this from happening rapidly, so that there is a time during which a gradual change is *349 realized on the grid of V1 which then eventually causes V1 to cut off and switch. If trigger pulses are applied to the grid of V1, as the grid of V1 approaches the triggering level, either positive or negative, it will switch in synchronism with the trigger pulses.

Capacitor 14 and resistor 26 constitute an RC time constant circuit and determine the frequency at which the multivibrator may switch from one state to the other during the free-run mode of operation.

39. Claim 2 of the '694 patent reads as follows:

2. A free-running multivibrator comprising a pair of electron discharge devices each having cathode, grid and plate elements connected to sources of operating potential, signal feedback means connecting said cathode elements together, conductive coupling means connecting the plate element of one of said discharge devices to the grid element of the other of said discharge devices, frequency determining conductive feedback means interconnecting said grid elements and operative to feed back to the grid element of said one discharge device after a predetermined time delay a potential change occurring at the grid element of said other discharge device to the grid element of the said one discharge device, and means for applying an external trigger signal to the grid element of said one discharge device.

40. Neither Jetronic nor Hickok challenges plaintiff's assertion of infringement of claim 2 of the '694 patent by oscilloscope model USM/81. Hickok, however, contends that the patent is invalid on grounds that 'new matter' was added to the patent application disclosure during prosecution in the Patent Office, in violation of 35 U.S.C. s 132. As filed, the patent drawing did not illustrate resistor 15 ,

as shown in Fig. 1 connected to ground and point 15. The specification, however, referred (at page 6) to the 'time constant of resistance 26 and capacitance 14, and this time constant may be varied within wide limits,' and also noted (at page 9) that 'the function of the resistance-capacitance network 26, 14 alternatively may be provided by a delay line or network.' In the first official action from the Patent Office, the patent examiner said, 'The statements on pages 6 and 9 (of the application) that 'the time constant of resistance 26 and capacitance 14' determine the time constant of the operation is questioned since condenser 14 is not connected in a time constant circuit. * * * Clarification is required.' The applicant thereafter amended the drawing to show resistor 15 , as in Fig. 1, thereby completing the circuit representation to make resistor 26 and capacitor 14 part of a 'time constant circuit.' The specification was amended to add the statement appearing at lines 49 to 67, column 3 of the patent. The remarks accompanying the applicant's request to amend the specification noted that such 'explanatory matter * * * has been rephrased substantially in accordance with the Examiner's suggestion.' The expert testimony at trial indicates that without resistor 15 in the circuit as shown in the drawing and described in the specification as amended, resistor 26 and capacitor 14 do not have a 'time constant' as disclosed in the application as filed; that the circuit would not operate as intended and disclosed by the applicant; and that without resistor 15 in the circuit as shown and described, it was clear to anyone skilled in the art that the circuit was incomplete. Giving due regard to the expert testimony and the patent examiner's requirement for and acquiescence in clarifying amendments to the specification and drawing, it is found that no new matter was added to the disclosure, but rather an implicit teaching was made explicit. Accordingly, Claim 2 of the '694 patent *350 is valid and infringed by Hickok and Jetronic oscilloscopes, model USM/81.

Patent 2,804,571

41. Patent 2,804,571 was granted to

plaintiff on application Serial No. 349,626, filed April 20, 1953, by J. R. Kobbe. The '571 patent issued August 27, 1957. It relates to an unblanking circuit for cathode-ray oscilloscopes. Plaintiff alleges that claims 5 and 8 are infringed by Hickok and Jetronic oscilloscopes, model USM/81.

follow the voltage appearing on the cathode of cathode follower 53.

*350

42. The '571 patent describes an unblanking circuit for a cathode-ray tube, the purpose of which is to ensure uniform brightness of each sweep of the electron beam across the tube face. With reference to the patent drawing (reproduced herein), the circuit comprises a cathode-ray tube, a common power source, a feedback circuit and three high voltage DC supplies. The cathode-ray tube is shown as tube 7; the common power source is oscillator tube 31; the feedback circuit includes resistors 73 and 75, leads 71 and 83, and regulator tubes 85, 87 and 89; and the three high voltage supplies are associated with rectifier tubes 37, 41 and 43. The power supply, consisting of tube 43, transformer secondary coil 27, capacitor 59, and resistors 55, 57 and 45, is completely isolated from other parts of the circuit, except for the connection to the cathode of cathode follower 53. Consequently, the voltage to which the negative power supply is referenced is the voltage of the cathode of cathode follower 53. Grid 13 of cathode-ray tube 7 is connected to the isolated power supply by lead 47 through capacitor 61. Consequently, the voltage on grid 13 will be the sum of the voltage on the cathode of cathode follower 53 plus the voltage developed by the power supply which includes rectifier tube 43; and accordingly, the voltage on grid 13 will follow in detail the voltage on the cathode of cathode follower 53, except that it will be removed in a negative direction from such voltage by the potential developed by the *351 power supply. It follows, therefore, that as long as the potential on the cathode of cathode follower 53 remains constant, the voltage on grid 13 remains constant. When the voltage on the cathode of cathode follower 53 changes, the voltage on grid 13 changes in like manner. Capacitor 61 and resistors 51 and 46 are selected with reference to the stray capacitance of the whole circuit, so that the waveform appearing on grid 13 will faithfully



*351 The voltage relationship between cathode 9 and grid 13 of cathode-ray tube 7 is maintained constant by the fact that secondary transformer windings 29 and 27 of oscillator transformer 23 are closely coupled magnetically and any variation which affects the voltage output of one secondary winding will similarly affect the voltage output of the other secondary winding.

The circuit is protected against long-term variations in DC (direct current) output by the feedback path 71 which connects to the grid of tube 85. Any variation in DC output levels or any variation in AC (alternating current) output level of the primary or the secondary windings of the transformer is automatically compensated for by a corresponding inverse change in the plate voltage supplied to the plate of oscillator tube 31 through the primary

winding 25 of the oscillator transformer 23. For example, if the high frequency voltage in primary winding 25 of the transformer for some reason increases, this will increase the DC output voltage of rectifier tube 37 (decreasing the level of the voltages, since this is a negative supply). This will cause a decrease in potential in the feedback circuits 71 and 83 to the grid of regulator tube 85. This, in turn, will cause an increase in the plate potential of regulator tube 85, causing an increase on the grid of regulator tube 87 and causing a decrease on the plate of regulator tube 87. This decrease in potential is fed back to primary winding 25 of the oscillator, causing a decreased voltage output of the oscillator tube 31 and thus counteracting the effect due to the increase in high frequency voltage of the transformer primary winding.

43. Claims 5 and 8 of the '571 patent read as follows:

5. In combination,
a cathode ray tube having a control grid, an anode and a cathode,
an unblanking circuit for the cathode ray tube including a first power supply directly connected to said grid for impressing a high negative voltage on said grid with respect to said cathode,
a separate power supply connected between said anode and said cathode for impressing a high positive voltage on said anode with respect to said cathode,
a controllable common power source from which said power supplies derive their energy so that a change in the power output of the power source affects both power supplies similarly,
means for supplying voltage pulses connected between said cathode and the positive side of the first power supply,
said first power supply being otherwise electrically isolated from the electrodes of said tube so that the voltage of said grid follows the waveforms of the pulses,
and feedback regulator means responsive to variations in the voltage of said separate power supply for preventing permanent drift of the output of the common power source from a predetermined value.

8. A cathode ray oscilloscope circuit,
including a cathode ray tube having a cathode and a control grid,
a power supply having its negative side connected through a first resistance to the grid of the cathode ray tube,
*352 the voltage of said power supply being sufficient to normally prevent conduction within the cathode ray tube,
a positive voltage pulse input means connected through a second resistance to the positive side of said power supply to supply positive unblanking pulses of sufficient value to unblank the cathode ray tube for the duration of each positive pulse,
a coupling capacitance connected directly between the positive pulse input means and said grid,
said power supply being otherwise

electrically isolated from the electrodes of said tube and the time constant of the portion of the circuit including the stray capacitance of the power supply and the second resistance means being substantially less than the time constant of that portion of the circuit including the coupling capacitance and said first resistance so that the leading edge of a positive pulse is immediately transmitted through the coupling capacitance to the grid of the cathode ray tube and said stray capacitance is charged by the positive pulse before any appreciable variation in the charge on the coupling capacitance has occurred.

44. Neither Jetronic nor Hickok challenges plaintiff's assertion of infringement of claims 5 and 8 of the '571 patent by oscilloscope model USM/81. Jetronic, however, contends that claims 5 and 8 are invalid in view of the prior art, particularly U.S. Patent 2,549,833 to Martinez, a reference not cited by the Patent Office during prosecution of the patent application. Jetronic says the Martinez patent, considered in conjunction with other prior art cited by the Patent Office, renders the subject matter of claims 5 and 8 anticipated or obvious.

Martinez teaches a wideband amplifier for direct current signals which Jetronic contends is substantially identical to the floating power supply used in the circuit of the '571 patent. The floating power supply includes tube 43, transformer secondary coil 27, capacitor 59, and resistors 55, 57 and 45. It is Jetronic's position, based on the prosecution file history of the '571 patent, that the claims in issue were allowed principally because the prior art before the patent examiner did not include a teaching like Martinez. While Martinez is pertinent prior art, the record including the application file history and expert testimony in this case does not support Jetronic's contentions. There are other substantial and unobvious differences over the prior art to support the patentability of claims 5 and 8. Accordingly, neither the Martinez patent alone nor in combination with other prior art considered by the Patent Office anticipates or makes obvious the subject matter of claims 5

and 8, and the claims are therefore valid and infringed by model USM/81 oscilloscopes.

Conclusion of Law

Upon the foregoing findings of fact and opinion which are made a part of the judgment herein, the court concludes as a matter of law that the patent claims below identified are valid and infringed:

Patent 3,061,788--claims 2, 4

Patent 2,769,905--claims 1, 5

Patent 2,769,904--claims 1, 8

Patent 2,853,609--claims 1, 16, 19

Patent 2,883,619--claims 1, 6

Patent 2,930,986--claim 1

Patent 2,826,694--claim 2

Patent 2,804,571--claims 5, 8

Accordingly, plaintiff is entitled to recover reasonable and entire compensation for unauthorized use by defendant of the patented inventions so-claimed, and judgment is entered to that effect. The extent of liability will be determined in further proceedings before a trial commissioner, pursuant to Rule 131(c)(2).

END OF DOCUMENT